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Systems Center
San Diego

TECHNICAL REPORT 1799
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Offshore Porewater and Flux Chamber Sampling of San Diego Bay Sediments at Site 9, Naval Air Station, North Island

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ADMINISTRATIVE INFORMATION

The work detailed in this report was performed for the South Bay Area Focus Team, Southwest Division, Naval Facilities Engineering Command by the Marine Environmental Quality Branch, Code D362, SSC San Diego.

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SB

EXECUTIVE SUMMARY

Previous modeling and measurements indicate Volatile Organic Compounds (VOCs) are migrating into San Diego Bay from groundwater sources originating at Naval Air Station North Island (NASNI), Installation Restoration (IR) Site 9. IR Site 9 is the location of the former Fiery Marsh, a chemical waste disposal area. Groundwater modeling indicates groundwater flow is directed from IR Site 9 towards the bay, and elevated concentrations of Trichloroethene (TCE), 1,1-Dichloroethene (1,1-DCE), 1,2-Dichloroethene (1,2-DCE), and Vinyl Chloride (VC) have been identified in sampling wells located along the western shore of North Island. Sampling in the region offshore from Site 9 shows elevated TCE and DCE levels to the south and inshore from Bravo Pier. Previous seepage meter deployments in this area also indicate a general trend of groundwater flow to the bay at rates of about 0.002 to 2.2 ft/day. The actual concentrations of TCE and DCE in the porewater, defined here as the water in the transition zone between groundwater and bay water, have not been previously established.

The Space and Naval Warfare Systems Center, San Diego (SSC San Diego) has developed technologies for assessing porewater contaminant levels and sediment water exchange of contaminants including in-situ, vacuum-filtration porewater samplers, and flux chambers for measuring the flux of contaminants from sediments. The diver-deployed porewater samplers allow interstitial waters to be extracted from the sediment at selected depths up to about 6 feet below the sediment water interface. The flux chamber technique employs an open bottom chamber sealed into the sediment. To measure the advective component of the flux, the standard flux chamber sampling technique was modified to allow for change in volume caused by groundwater migration. The result produced a time series of seepage measurements combined with a time series of concentrations. From these, the flow rate and concentration of the groundwater discharge at the site were calculated and used to estimate the mass loading of VOCs to the bay over tidal periods.

Twenty sampling sites for porewater analysis were selected based on previous qualitative findings from the activated charcoal samplers and seepage measurements. The locations included a range of conditions for VOCs and seepage. The sites also included locations further to the south than previous sampling efforts to delineate the southern extent of contamination. Based on the high concentrations from the porewater analysis, six sites were chosen for flux chamber sampling.

Porewater measurements at 20 offshore stations at North Island, IR Site 9, indicate that elevated levels of VOCs are present in a tightly restricted area near the southern reach of Bravo Pier. The highest levels were always observed at the deepest measurement points, indicating that the concentrations are significantly attenuated within the sediment before entering the bay. In addition, the primary VOCs observed were 1,1-DCE, 1,2-DCE, and VC, indicating that degradation of the TCE source product is occurring before the material reaches the bay.

Measurement of water seepage and VOC fluxes at six offshore stations where elevated VOCs were measured indicate that fluxes of VOCs to the bay are limited primarily to the areas around stations PW02 and PW03 between Bravo Pier and the shore. Seepage measurements show that the flux is driven largely by a tidal pumping of the porewater in which porewater with elevated VOC levels migrates out during low water, and bay water with undetectable VOC levels returning to the sediment

during high water. The flux measurements indicate that overall, the largest VOC flux to the bay is for 1,2-DCE with an estimated total annual input of about 4.6 kg, followed by 1,1-DCE with 1.4 kg, VC with 1.3 kg, and TCE with 0.001 kg (1.2 g).

Based on the low or undetectable levels of VOCs in ambient bay water, the relatively high solubility of the target VOCs, and the close proximity to the mouth of the bay, it appears likely that any materials entering the bay at this site are rapidly flushed to the ocean. However, the potential for localized effects on infaunal organisms near PW02 and PW03 does exist and should be evaluated.

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ACRONYMS

CTD	Conductivity, Temperature, and Depth probe
1,1-DCE	1,1-Dichloroethene
1,2-DCE	1,2-Dichloroethene
EPA	Environmental Protection Agency
GPS	Global Positioning System
IR	Installation Restoration
MLLW	Mean Lower Low-Water
NASNI	Naval Air Station North Island
SSC San Diego	Space and Naval Warfare Systems Center, San Diego
TCE	Trichloroethene
VC	Vinyl Chloride
VOC	Volatile Organic Compounds

UNITS OF MEASURE

cm	centimeters
cm^3/cm^2/day	cubic centimeters per square centimeter per day
°C	degrees centigrade
ft	feet
ft^2	square feet
ft/day	feet per day
g	grams
GPM	gallons per minute
in	inches
kg	kilograms
kg/m^3	kilograms per cubic meter
m	meters
m^2	square meters
mg/day	milligrams per day
ml	milliliters
ppt	parts per thousand
µg/L	micrograms per liter

1. BACKGROUND

Previous modeling and measurements (Naval Facilities Engineering Command, Southwest Division, 1996) indicate Volatile Organic Compounds (VOCs) are migrating into San Diego Bay from groundwater sources originating at Naval Air Station North Island (NASNI), Installation Restoration (IR) Site 9. IR Site 9 is the location of the former Fiery Marsh, a historical chemical waste disposal area. Groundwater modeling indicates groundwater flow directed from Site 9 towards the bay, and elevated concentrations of Trichloroethene (TCE), 1,1-Dichloroethene (1,1-DCE), 1,2-Dichloroethene (1,2-DCE), and Vinyl Chloride (VC) have been identified in sampling wells along the western shore of North Island. Sampling in the region offshore from IR Site 9 shows elevated TCE and DCE levels to the south and inshore from Bravo Pier. Seepage meters deployed in this area also indicate a general trend of groundwater flow to the bay at rates of about 0.002 to 2.2 ft/day (0.06 to 67 cm/day). The actual concentrations of TCE and DCE in the porewater, defined here as the water in the transition zone between groundwater and bay water, have not been previously established.

The Space and Naval Warfare Systems Center, San Diego (SSC San Diego) has developed technologies for assessing porewater contaminant levels and sediment water exchange of contaminants including in-situ, vacuum-filtration porewater samplers, and benthic flux chambers for measuring the flux of contaminants from sediments. The diver-deployed porewater samplers allow interstitial waters to be extracted from the sediment at selected depths up to about 6 feet below the sediment water interface.

The flux chamber technique employs an open bottom chamber sealed into the sediment. In the standard operating mode, the water within the chamber is then sampled over 2 to 4 days and the flux of contaminants is estimated based on the time change of concentration within the chamber. This reveals the flux caused by the combined action of porewater diffusion and bioirrigation. However, this study focused on determining the advective flux caused by groundwater migration. To include the advective component of the flux, the standard sampling technique was modified to allow for change in volume caused by groundwater migration. The final result produced a time series of seepage measurements combined with a time series of concentrations from which the flow rate and concentration of the groundwater discharge at the site can be calculated and used to estimate the mass loading of VOCs to the bay over tidal periods.

2. METHODS

2.1 SCOPE OF WORK

The proposed work plan required the completion of the following tasks: (1) obtain and analyze surficial and deep porewater samples at 20 sampling sites, and (2) perform combined flux/seepage rate measurements at six proposed sites.

2.2 SAMPLE SITES

Twenty sampling sites for porewater analysis were selected based on previous findings from the 1995 offshore screening survey using Petrex samplers (activated charcoal absorbent) (Naval Facilities Engineering Command, Southwest Division, 1996). Figure 1 shows the locations of the porewater sampling sites for this survey. The locations included a range of conditions for VOCs and seepage. The sites also included locations further to the south than previous sampling efforts to delineate the southern extent of contamination.

2.3 POREWATER SAMPLING

To determine if VOCs were present in the interstitial water at the interface between the bay and IR Site 9, porewater samples were obtained from both near surface (1 ft~30 cm) and deep (5 ft~150 cm) water. The porewater was analyzed for VOC concentrations and if further sampling for flux was warranted.

2.3.1 Sample Collection

Porewater was collected by syringe extraction through small-diameter stainless steel probes (figure 2). The probes consisted of a length of ¼-inch-diameter stainless steel tubing fitted with a solid point. There was a sample port consisting of a slot covered by a small-mesh-size, stainless steel screen on the side of the tube near the tip. Divers inserted the probe into the sediment to the required depth. During insertion, the top end of the probe was capped. Following insertion, a dual syringe system was attached to the probe's top end. A Y-valve directed the water first to a purging syringe, and then to a sampling syringe. The purging syringe withdrew approximately 50 ml (an estimated 4 to 12 sampler volumes for the 5-ft and 1-ft probes respectively), and the sample syringe withdrew approximately 100 ml. The samples were then returned to the surface. At the surface, the water in the sampling syringe was transferred to two 40-ml, pre-acidified (pH 2), screw cap vials with polytetrafluorethylene (PTFE)-faced silicone septa, and stored on ice at 4°C prior to shipment and analysis. The operation was then repeated at the next station using a new pre-cleaned set of probes, syringes, and sampling tubes. The process was repeated twice (1 ft and 5 ft) at each of the 20 stations.

2.3.2 Sample Shipment

Prior to shipment, all samples were stored at 4°C. Samples were held for no more than 7 days before shipment. During shipment, samples were held on ice at 4°C in a darkened ice chest. Samples were shipped by overnight carrier to the analytical laboratory.

2.3.3 Sample Analysis

Samples were analyzed for VOCs according to standard Environmental Protection Agency (EPA) method 8260A.

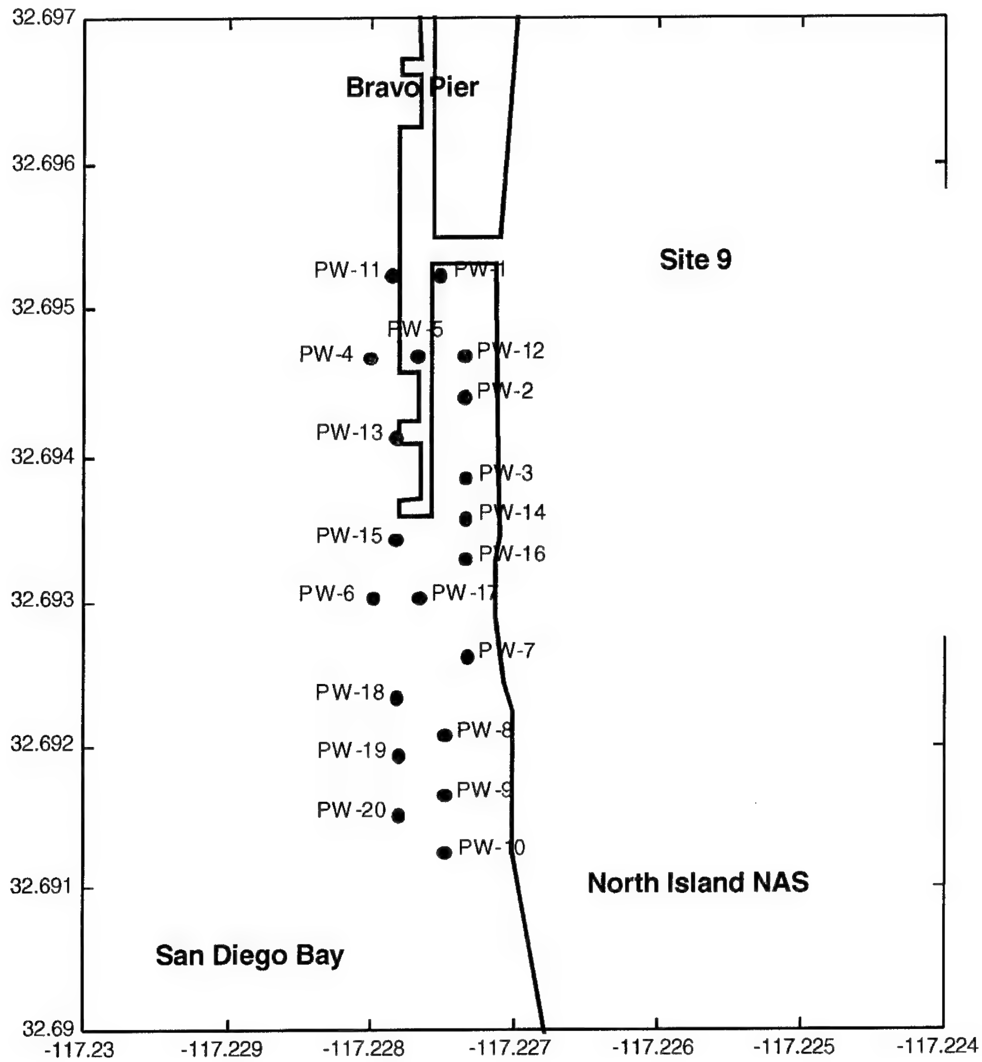


Figure 1. Location of stations for the offshore porewater (black and red) and flux (red) sampling.

2.4 FLUX AND SEEPAGE RATE MEASUREMENTS

On the basis of the results from the porewater analysis, a total of six sites were chosen for flux chamber sampling, including locations corresponding to the same sites as the porewater samples at PW02, PW03, PW04, PW12, PW13, and PW14 (figure 1; see discussion of porewater results). Some modifications and testing of the flux chamber system were required to accomplish the flux and seepage measurements.

2.4.1 System Modifications

Testing of the existing flux chamber system indicated that the sampling tubes and valve orifices were too small to allow unrestricted seepage measurements. To alleviate this problem, a modified system was constructed based on the standard seepage meter geometry used in previous studies (Lee, 1977). However, instead of a single sampling bag, a multiport sampling configuration was used. The system incorporated two rotary selector valves that allowed six sample bags to be attached. A control system attached to the valves allowed the sampling to be performed at pre-selected intervals (figure 3).

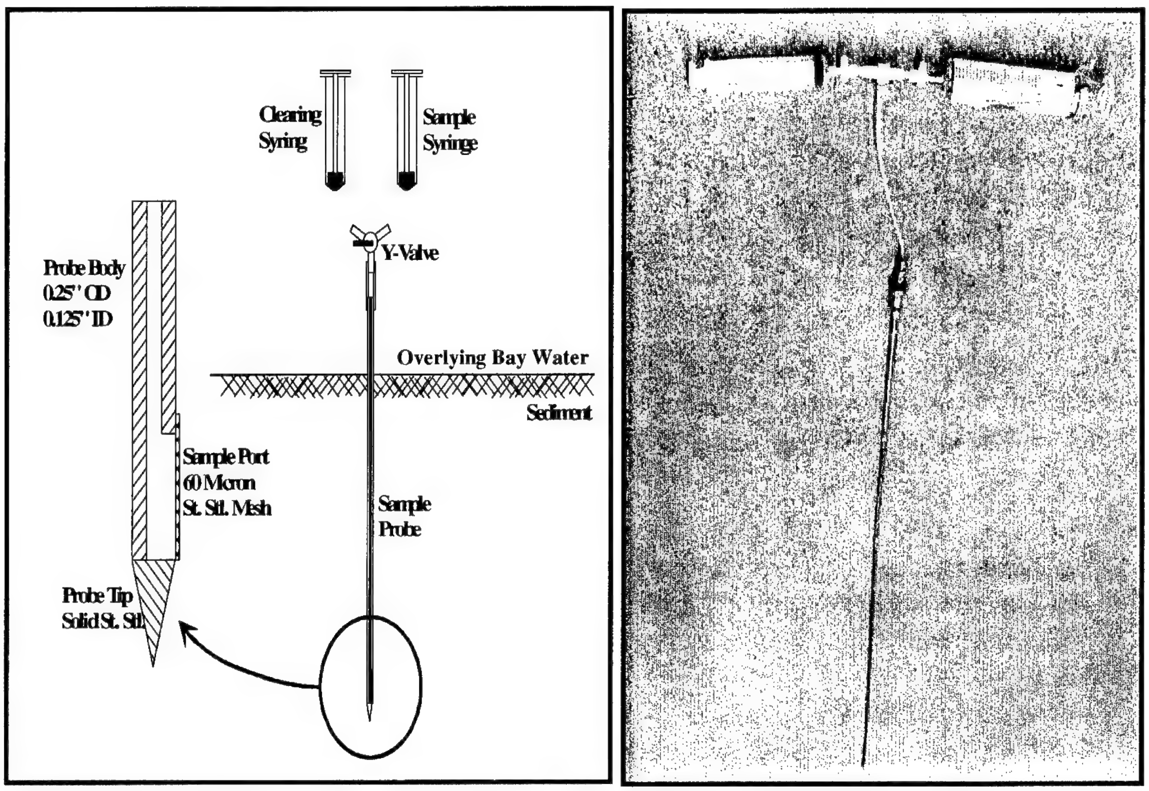


Figure 2. Schematic and photograph of the porewater sampling probe.

2.4.2 System Testing

A cleaning procedure for the seepage meter was conducted based on standard methods for sampling for trace level VOCs. The procedure included cleaning the seepage chamber, tubing and rotary valves with sequential washes of tap water, 30°C one-percent Alconox solution, and deionized (DI) water. A blank test was run by collecting samples of the final DI rinsate that was passed through the sampling system. VOC concentrations were then measured to assure that samples were not contaminated during the collection process.

2.4.3 Sample Collection

A time series measurement was conducted at each of the six sites. The measurement period began at slack low water and continued for about 12 hours. Before deployment, each of the six sample bags was pre-filled with 100 ml of deionized water. The seepage meter was deployed from the Navy survey boat ECOS and a diver surveyed the site to assure proper

positioning on the bottom. The measurement consisted of six sequential samples. Each individual sample was collected by opening the sampling valve for about 2 hours. When one valve closed, the next one opened and the sampling continued until all six samples were collected at the site. The flux chamber was then retrieved and samples were shipped for analysis. Following cleaning, the chamber was fitted with new bags and re-deployed. At each site, additional sampling included ambient water samples collected by a diver during the deployment phase. Ambient water samples were collected by subsurface filling of 40-ml glass vials at each sample station. In addition, sensors attached to the chamber monitored changes in ambient salinity, temperature, and density. The field sampling required about 1 day per site for a total of 6 days to complete six sites.

2.4.4 Sample Shipment and Analysis

Porewater sample shipment and analysis was as described above for porewater. In addition, sample bags were weighed before and after each deployment to determine the amount of seepage and variation with time. Only sample bags with sufficient positive seepage were sent to the laboratory for VOC analysis.

2.5 ANCILLARY DATA COLLECTION

A Seabird model SBE11 conductivity, temperature, and depth (CTD) probe was deployed during flux measurements at stations PW02, PW03, and PW04. The measurements were used to determine the variation in tidal height and the ambient density of the bay water during each deployment.

A bathymetric survey was conducted in the Bravo Pier vicinity to determine the offshore topography in the study region. Water depth was determined using a InnerSpace Technologies model 445 fathometer, while positions were recorded using a Trimble model 4000RL differential Global Positioning System (GPS). The fathometer depth resolution is about 0.1 m, and the GPS spatial resolution is about 2 to 3 m. Figure 4 shows the depth measurements recorded along the track. Final depths were corrected to mean lower low water (MLLW) rates using tide height corrections generated from the tidal prediction program, TIDE-1.

2.6 SAMPLING SCHEDULE

Porewater and flux sampling dates and times were dictated by operational restrictions on access to the sampling site. They were also dictated by daylight sampling and slack water to improve diving conditions during porewater sample collection and flux chamber deployment/retrieval. In addition, flux sampling was scheduled to occur during relatively strong (spring) tides with similar ebb and flood tidal range over the semidiurnal (~12-hour) sampling period. The CTD sampling was performed with the flux sampling. The bathymetric survey was performed later and coincided with high water to allow improved coverage in shallow water. Table 1 shows the sampling schedule for all surveys.

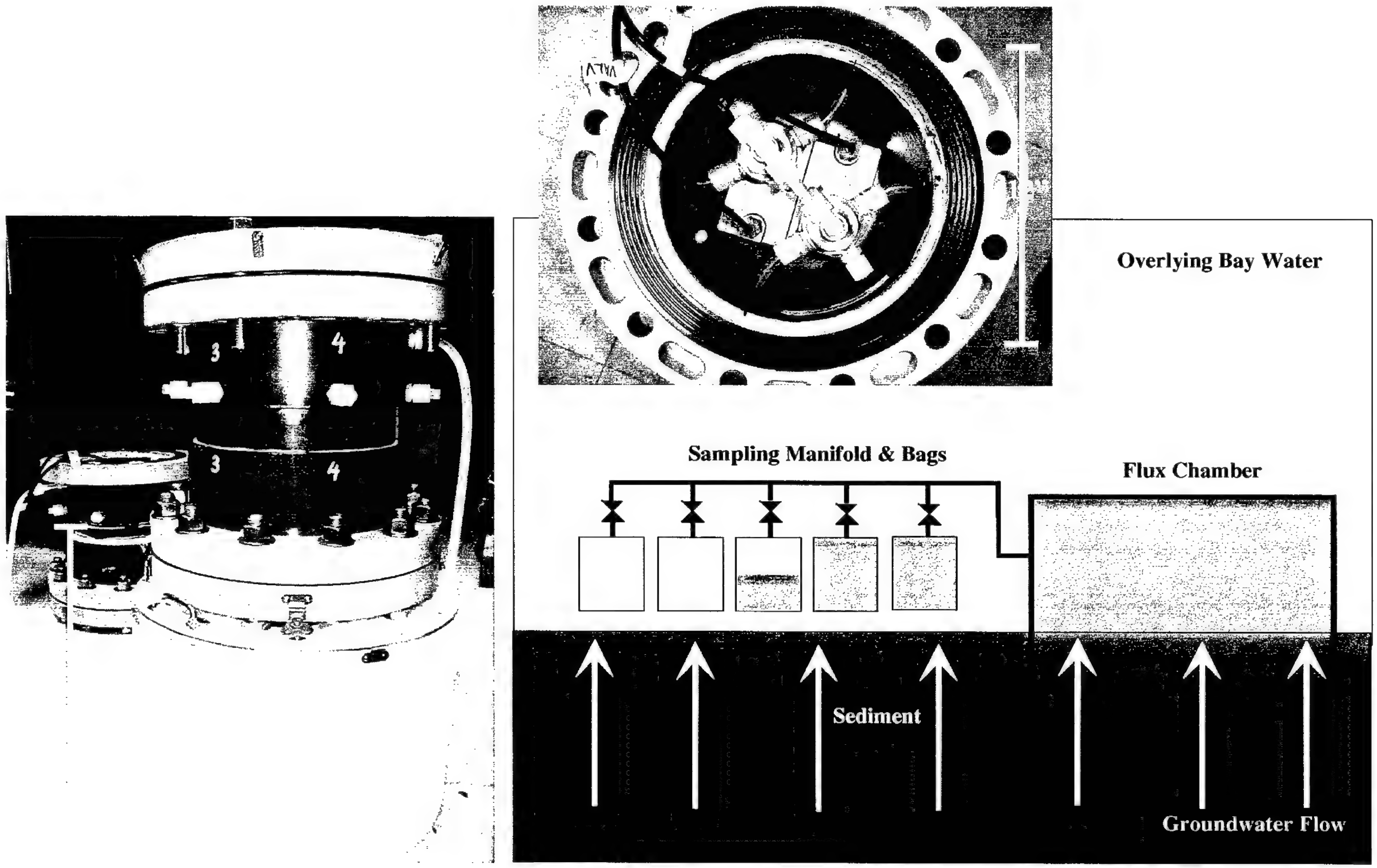


Figure 3. Flux chamber used during VOC seepage and flux measurements at North Island, IR Site 9.

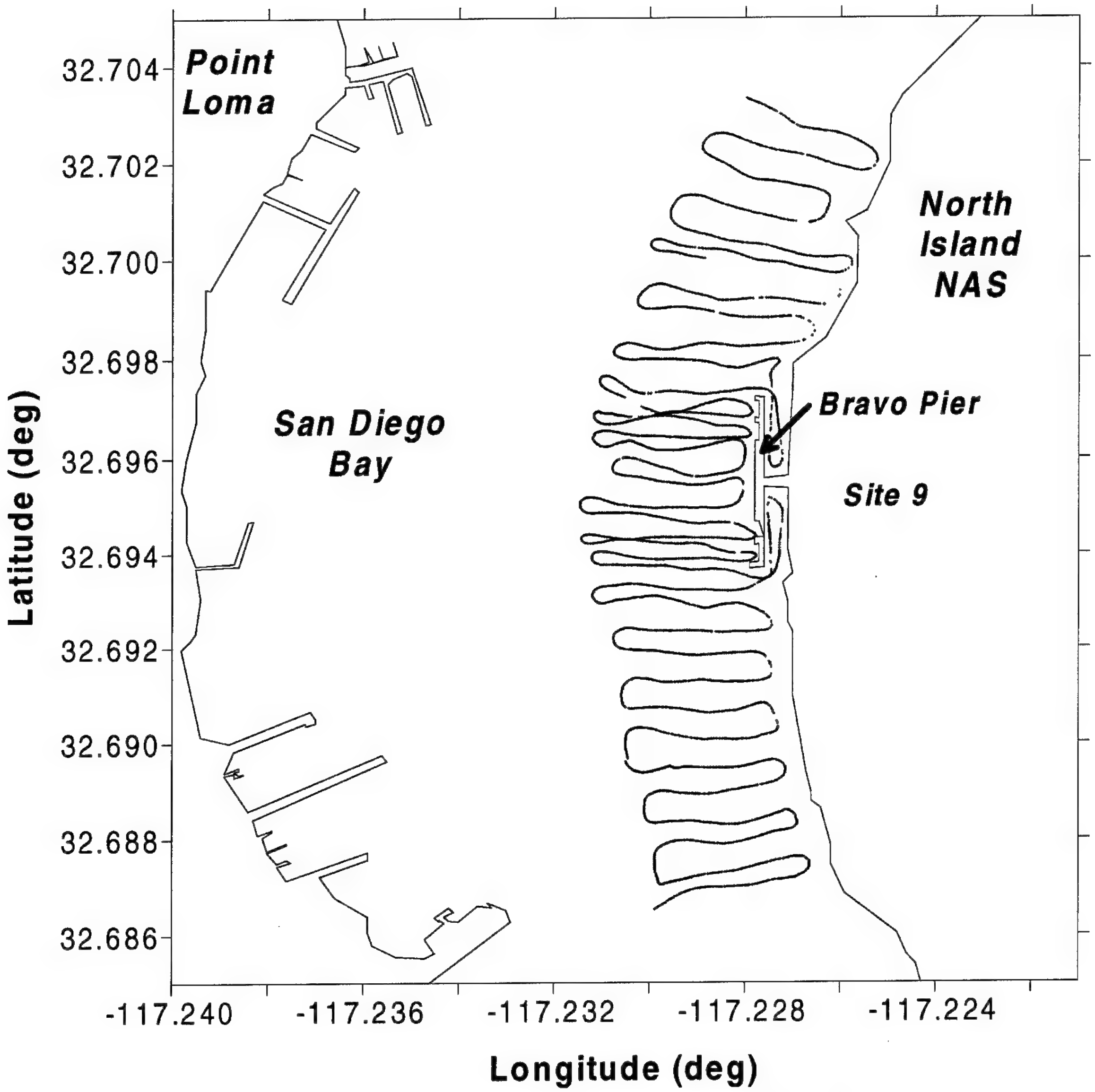


Figure 4. Survey track for bathymetry mapping at Pier Bravo.

Table 1. Sampling schedule for the offshore surveys at North Island, IR Site 9.

Survey	Station	Start Date	Start Time	End Date	End Time
Porewater	PW01	2/9/98	1540	NA	NA
Porewater	PW02	2/10/98	1515	NA	NA
Porewater	PW03	2/10/98	1550	NA	NA
Porewater	PW04	2/9/98	1440	NA	NA
Porewater	PW05	2/9/98	1520	NA	NA
Porewater	PW06	2/12/98	1230	NA	NA
Porewater	PW07	2/12/98	1340	NA	NA
Porewater	PW08	2/13/98	1415	NA	NA
Porewater	PW09	2/13/98	1340	NA	NA
Porewater	PW10	2/13/98	1315	NA	NA
Porewater	PW11	2/9/98	1350	NA	NA
Porewater	PW12	2/9/98	1620	NA	NA
Porewater	PW13	2/10/98	1340	NA	NA
Porewater	PW14	2/10/98	1620	NA	NA
Porewater	PW15	2/10/98	1430	NA	NA
Porewater	PW16	2/12/98	1435	NA	NA
Porewater	PW17	2/12/98	1415	NA	NA
Porewater	PW18	2/12/98	1300	NA	NA
Porewater	PW19	2/13/98	1240	NA	NA
Porewater	PW20	2/13/98	1210	NA	NA
Flux/CTD	PW02	4/24/98	1445	4/25/98	0315
Flux/CTD	PW03	4/25/98	1457	4/26/98	0337
Flux/CTD	PW04	4/26/98	1627	4/27/98	0457
Flux	PW12	4/24/98	1532	4/25/98	0402
Flux	PW13	4/26/98	1541	4/27/98	0411
Flux	PW14	4/25/98	1510	4/26/98	0340
Bathymetry	-	6/29/98	1300	6/29/98	1530

3. RESULTS AND DISCUSSION

3.1 POREWATER

Porewater samples were collected from 20 stations at depths of 1 ft and 5 ft below the sediment surface. At a few sampling stations, the 5-ft target depth could not be reached but sample depths were generally between 3 to 5 ft at these stations. The primary analytes of interest for this study were TCE and selected degradation products: 1,2-DCE, 1,1-DCE, and VC. Although a complete VOC analysis scan was run, the report only provides the results for these compounds. Appendix A includes the complete analytical results table. Table 2 and figures 5 through 8 show the selected porewater analysis results.

Table 2. Selected porewater analysis results for offshore survey at North Island, IR Site 9. All concentrations are in µg/L.

	TCE		1,1-DCE		1,2-DCE		VC	
Site	1 ft	5 ft	1 ft	5 ft	1 ft	5 ft	1 ft	5 ft
PW–1	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	<0.5	<0.5
PW–2	<0.5	180	<0.5	2100	0.8	42000	3.3	800
PW–3	<0.5	34	<0.5	9000	1.5	5500	0.4 J	12000
PW–4	<0.5	0.2 J	<0.5	17	0.8	63	<0.5	8.5
PW–5	<0.5	<0.5	<0.5	<0.5	<0.5	0.8	<0.5	0.7
PW–6	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
PW–7	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
PW–8	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
PW–9	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
PW–10	<0.5	<0.5	<0.5	<0.5	<0.5	0.3 J	<0.5	<0.5
PW–11	<0.5	<0.5	<0.5	0.3 J	<0.5	1.4	<0.5	0.4 J
PW–12	<0.5	0.06 J	<0.5	0.5 J	0.8	2.5	0.7	1.4
PW–13	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	1.5
PW–14	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
PW–15	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
PW–16	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
PW–17	<0.5	<0.5	0.4 J	<0.5	1	<0.5	<0.5	<0.5
PW–18	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	<0.5	<0.5
PW–19	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	<0.5	<0.5
PW–20	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5

J indicates concentration below reporting limit.

Concentrations at the 5-ft depth were generally higher than those observed at the 1-ft depth. Among stations, the highest levels of TCE (180 micrograms per liter (µg/L)) and 1,2-DCE (42000 µg/L) were reported at PW02 (5 ft depth), while the highest levels of 1,1-DCE (9000 µg/L) and VC (12000 µg/L) were reported at PW03 (5-ft depth). Moderate

levels (>10 μg/L) of VOCs were measured at the 5-ft depth at station PW04, and low levels (>1 μg/L) of VOCs were also reported at stations PW05, PW11, PW12, and PW13. At all other stations (PW01, PW06, PW07, PW08, PW09, PW10, PW14, PW15, PW16, PW17, PW18, PW19, and PW20), either trace levels or undetectable levels were reported.

The porewater measurements indicate that elevated VOC levels in the sediments near Bravo Pier are generally restricted to the shaded regions shown in figures 5 through 8. The results also indicate that concentrations are attenuated at the 1-ft depth as compared to the 5-ft depth, probably caused by tidal pumping of the porewater (see seepage results below). It appears that any influx to the bay would most likely occur near stations PW02 and PW03. On this basis, six stations were chosen for further study using the flux chamber. These included PW02 and PW03, which showed the highest porewater VOC levels; PW04, which showed moderate levels; and PW12, PW13, and PW14, which bounded on the region of high porewater VOC levels.

3.2 SEEPAGE AND VOC FLUX

Flux measurements were performed at stations PW02, PW03, PW04, PW12, PW13, and PW14. At each station, a time series of six samples was collected and analyzed to determine the amount of water seeping into or out of the sample bags, and the chemical content of VOCs in the sample bags. From these measurements, seepage rates of water, the VOC content of the seep water, and the overall flux of VOCs caused by seepage were estimated.

3.2.1 Seepage

Water seepage rates (S) were determined based on the weight difference of the seepage bags (Δw) over the sampling period (Δt) according to

$$S = \frac{\Delta w}{\rho A \Delta t},$$

where A is the surface area of the flux meter and ρ is the density of the seepage water. The weight differences were obtained directly by measuring the bag weights before and after each deployment. The surface area of the flux meter was determined by measuring the diameter and calculating the enclosed circular area. The density of the samples was assumed similar to ambient density that was obtained from the CTD measurements (figures 20 through 22). The measured ambient density ranged from about 1023.5 kilograms per cubic meter (kg/m^3) to 1024.5 kg/m^3, and a nominal value of 1024 kg/m^3 was used for all seepage calculations.

Figures 10 and 11 show the water seepage measurement results. Overall, the seepage showed a strong correlation with the tidal height, with the strongest outward seepages (positive) occurring just before slack low water and inward seepages (negative) prevailing during high tides. The exception to this correlation occurred at PW13, where the seepage was always out of the sediment and the strongest seepage occurred during high tide. Observed seepages for individual measurements ranged between −1 cubic centimeters per square centimeters per day (cm^3/cm^2/day) and 10 cm^3/cm^2/day compared to 0.06-67 cm^3/cm^2/day measured in the 1995 study.

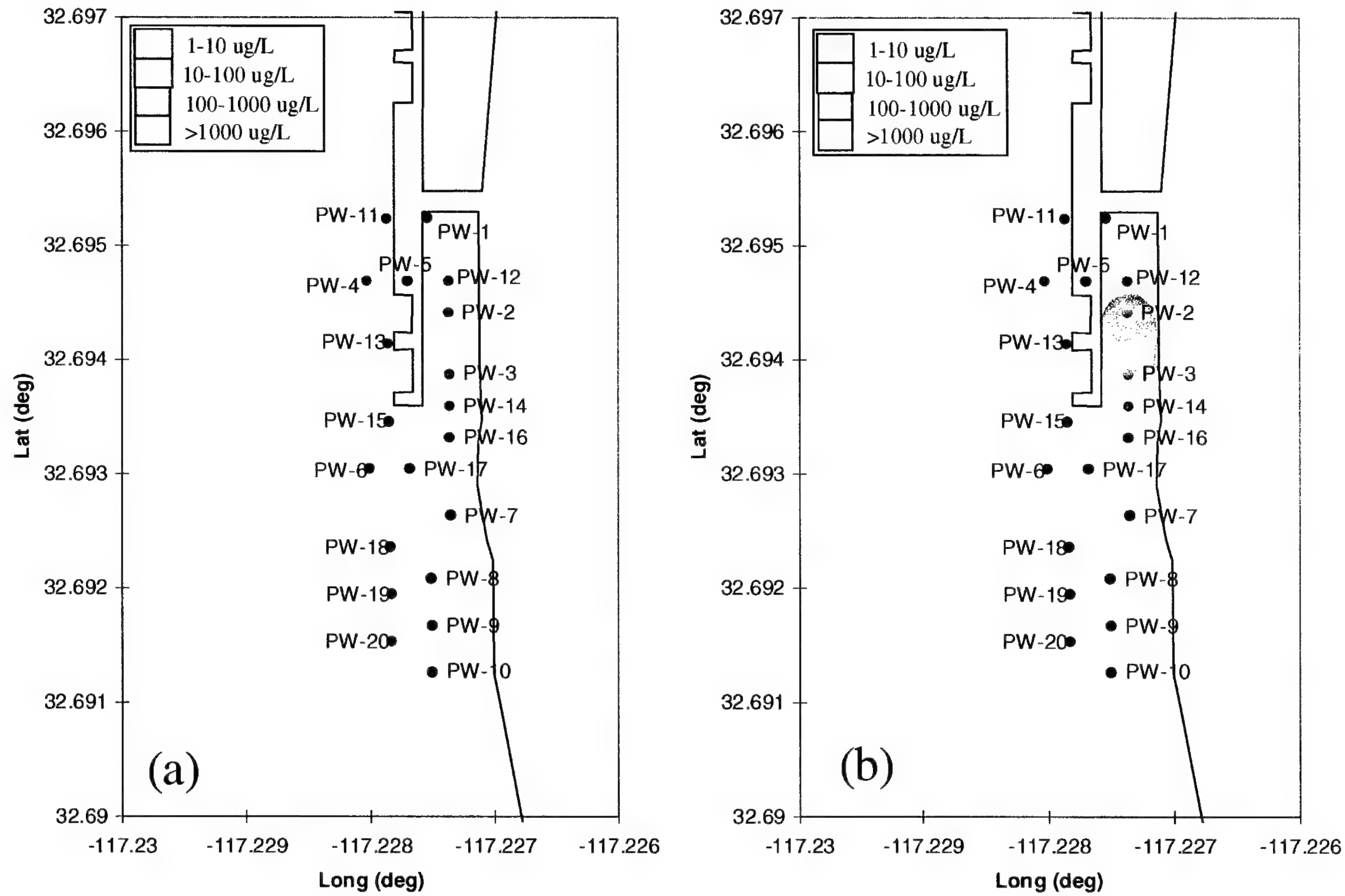


Figure 5. Porewater survey results showing TCE concentrations at 1-ft sediment depth on the left (a) and TCE concentrations at 5-ft depth on the right (b).

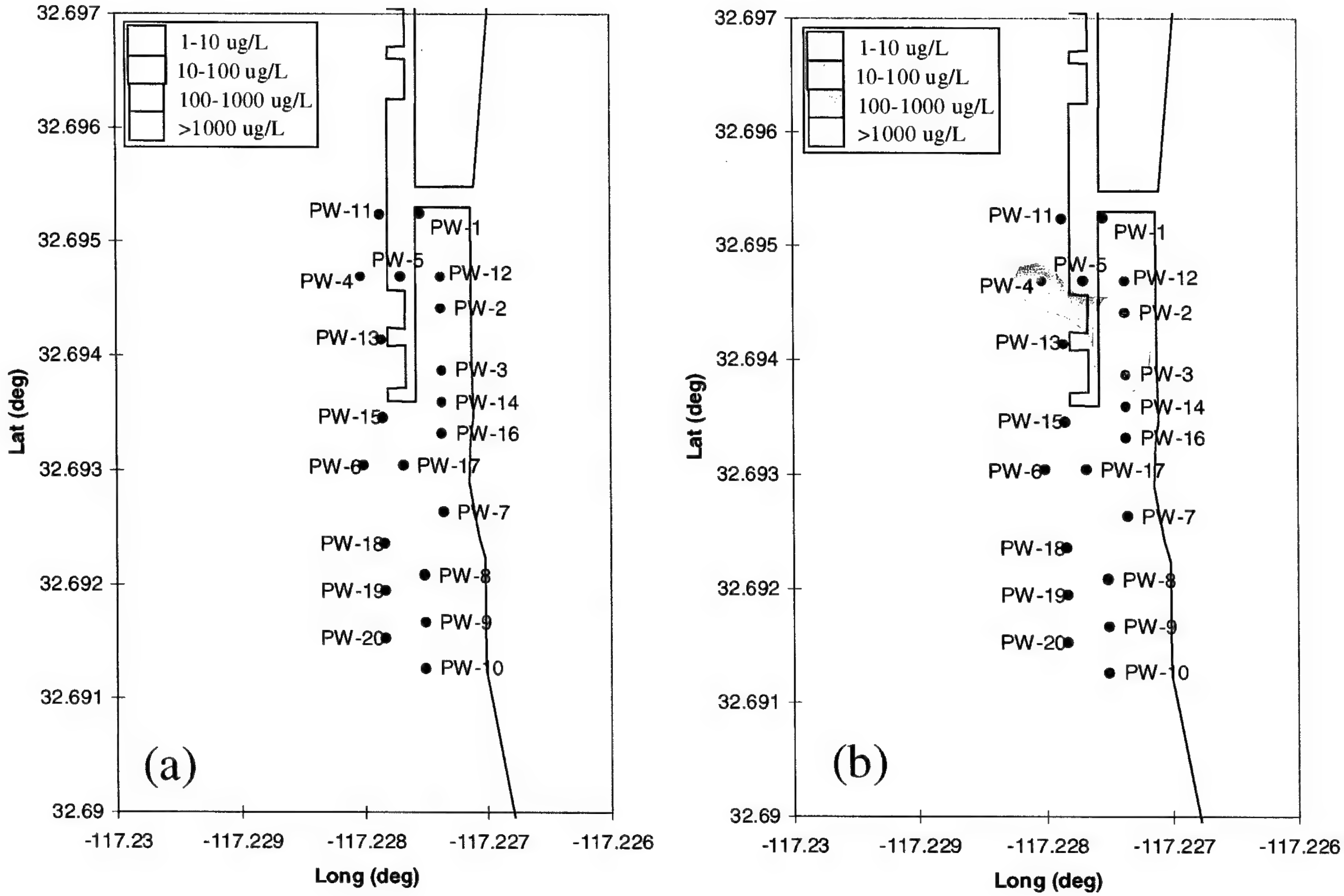


Figure 6. Porewater survey results showing 1,1-DCE concentrations at 1-ft sediment depth on the left (a) and 1,1-DCE concentrations at 5-ft depth on the right (b).

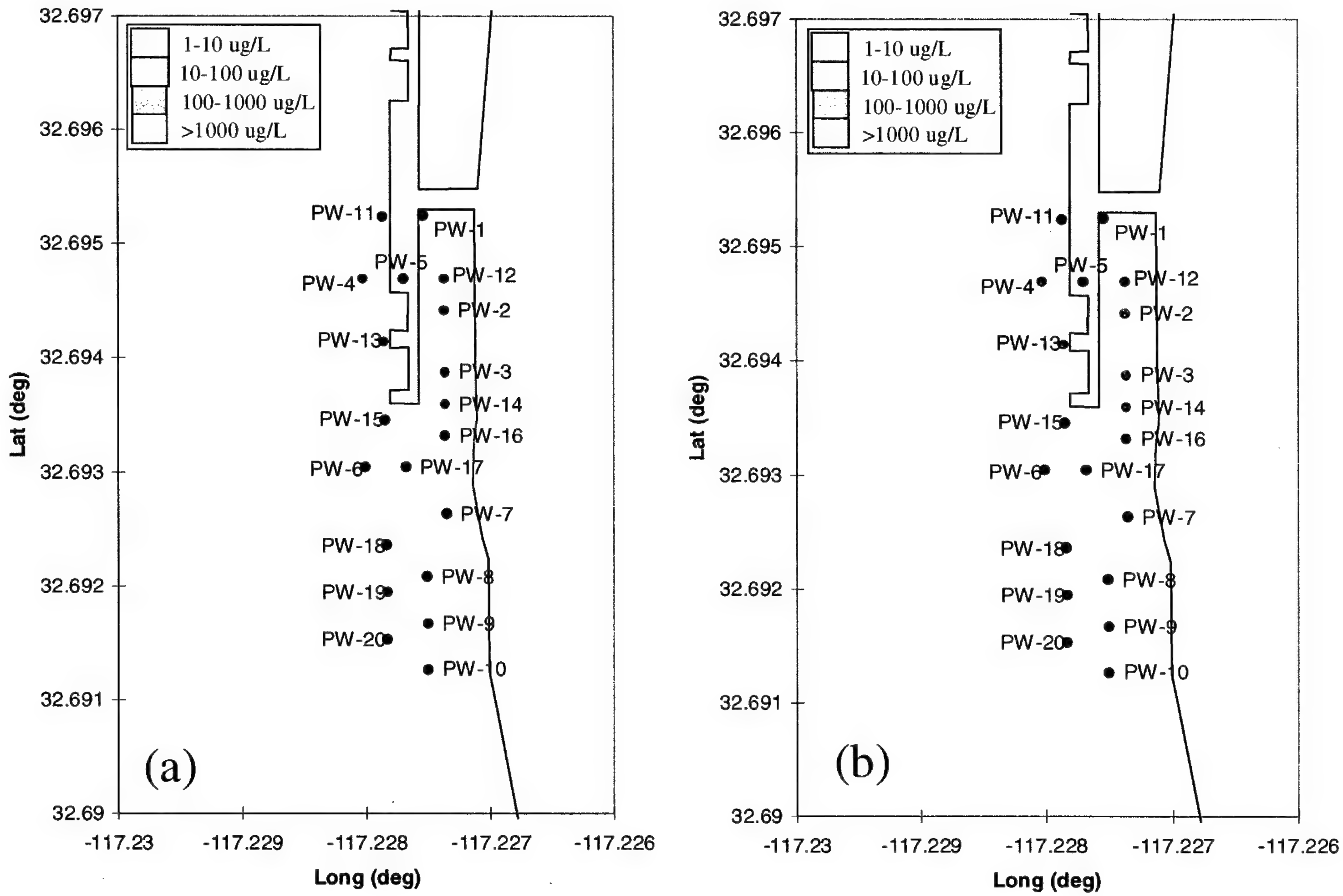


Figure 7. Porewater survey results showing 1,2-DCE concentrations at 1-ft sediment depth on the left (a) and 1,2-DCE concentrations at 5-ft depth on the right (b).

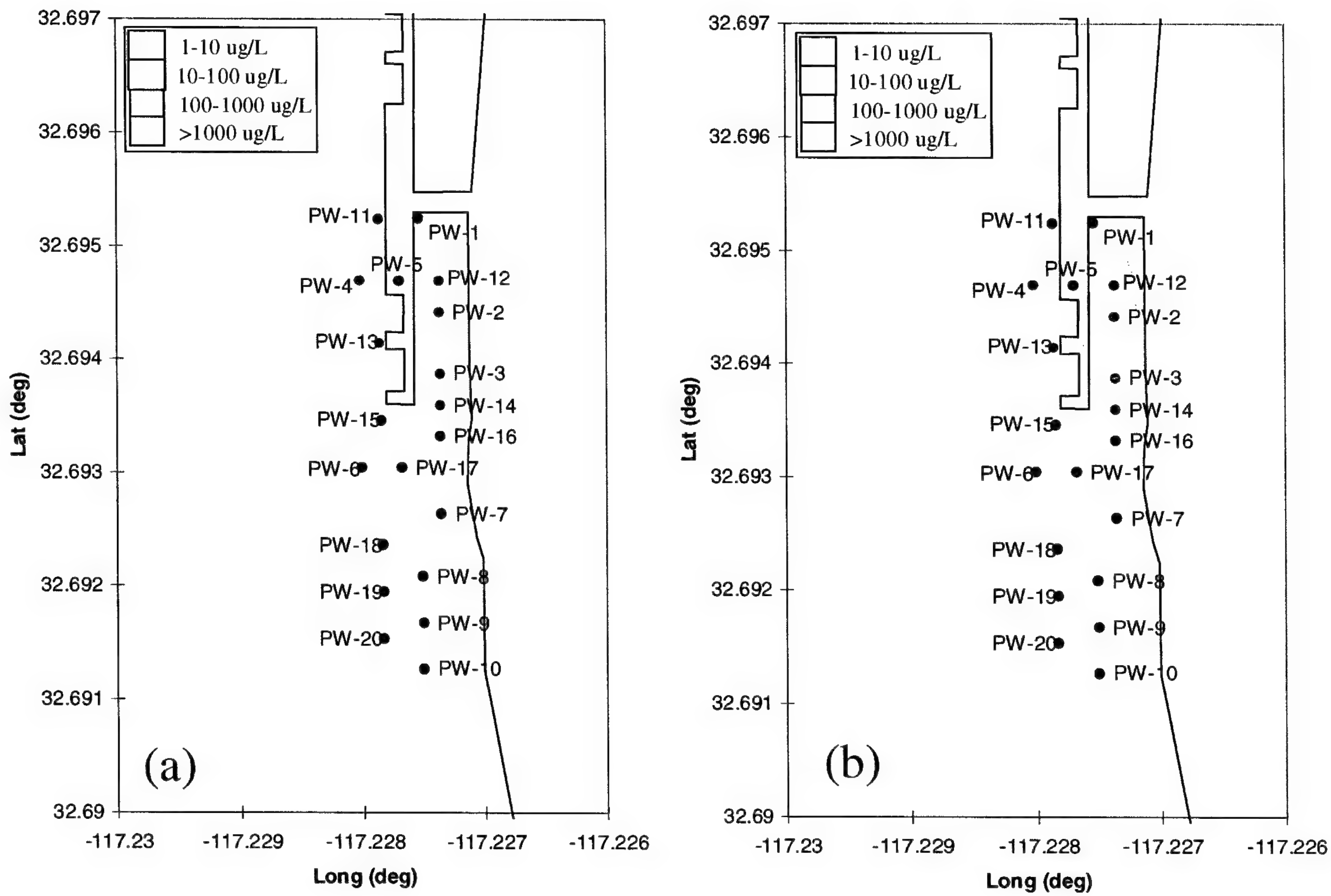


Figure 8. Porewater survey results showing VC concentrations at 1-ft sediment depth on left (a) and VC concentrations at 5-ft depth on right (b).

At each station, the tidal minimum, maximum, and mean seepage rate was calculated (table 3). The outward component of the seepage was also calculated as the mean of positive seeps at a given station, and from this calculation, the outward flow rate of water was estimated in gallons per minute (gal/min). As figure 9 and table 4 show, flow rates were calculated based on spatial areas assigned to each station. The areas were determined by bisecting the distances between stations where measurements were made. While the tidal mean seepage is useful for determining the net exchange of water between the sediment and the bay, the outward seepage is the component that potentially carries VOCs from the sediment to the bay and thus determines the flux. This is discussed further in the following section.

The largest mean and outward seepage rates were observed at PW13. As previously mentioned, the seepage behavior at this station was different than the other stations in that the highest seeps occurred during high tide. The cause of this large seep is unknown; however, it may be related to the station being located at the outer edge of Bravo Pier in a region where dredging has developed a steep slope in the bottom topography. Mean and outward seepage at the other stations were comparable with the shoreward stations (PW02, PW03, and PW14) showing somewhat higher seepage than the offshore station at PW04.

Table 3. Seepage measurement statistics.

Seepage Rate	Units	PW02	PW03	PW04	PW12	PW13	PW14
Mean	$cm^3/cm^2/day$	0.56	1.34	0.15	0.21	4.17	0.56
Minimum	$cm^3/cm^2/day$	-0.41	-0.35	-0.38	-0.45	1.62	-0.60
Maximum	$cm^3/cm^2/day$	2.37	6.14	1.23	1.27	9.19	4.42
Outward	$cm^3/cm^2/day$	0.71	1.41	0.29	0.31	4.17	0.81
Outward Flow	GPM	2.74	5.39	1.25	1.00	23.96	2.29

NOTE: Outward flow estimates are based on bay floor seepage areas listed in table 4.

Table 4. Spatial areas assigned to stations PW03, PW04, PW13, and PW14, where VOC fluxes were measured.

Station	X (ft)	Y (ft)	Area (ft^2)	Area (m^2)
PW02	150	150	22500	2090
PW03	150	150	22500	2090
PW04	125	200	25000	2323
PW12	125	150	18750	1742
PW13	150	225	33750	3135
PW14	150	100	15000	1394

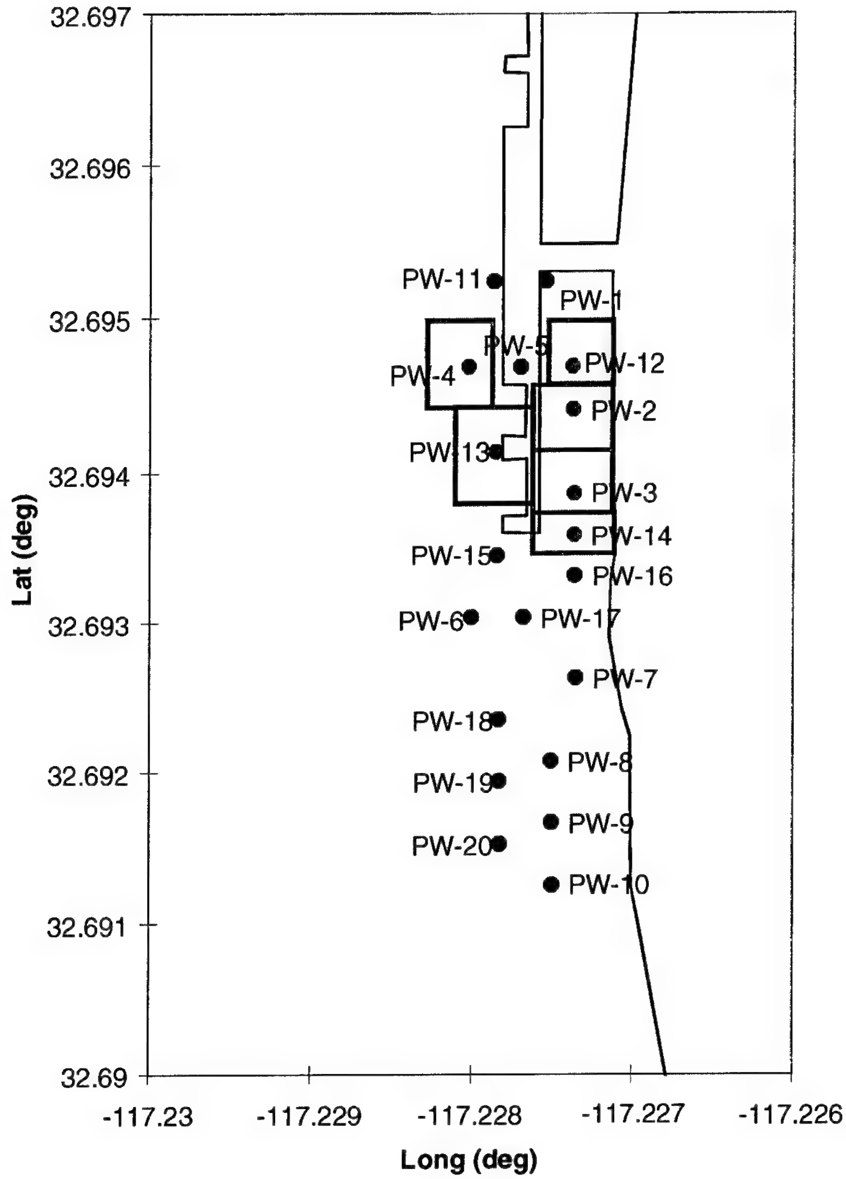
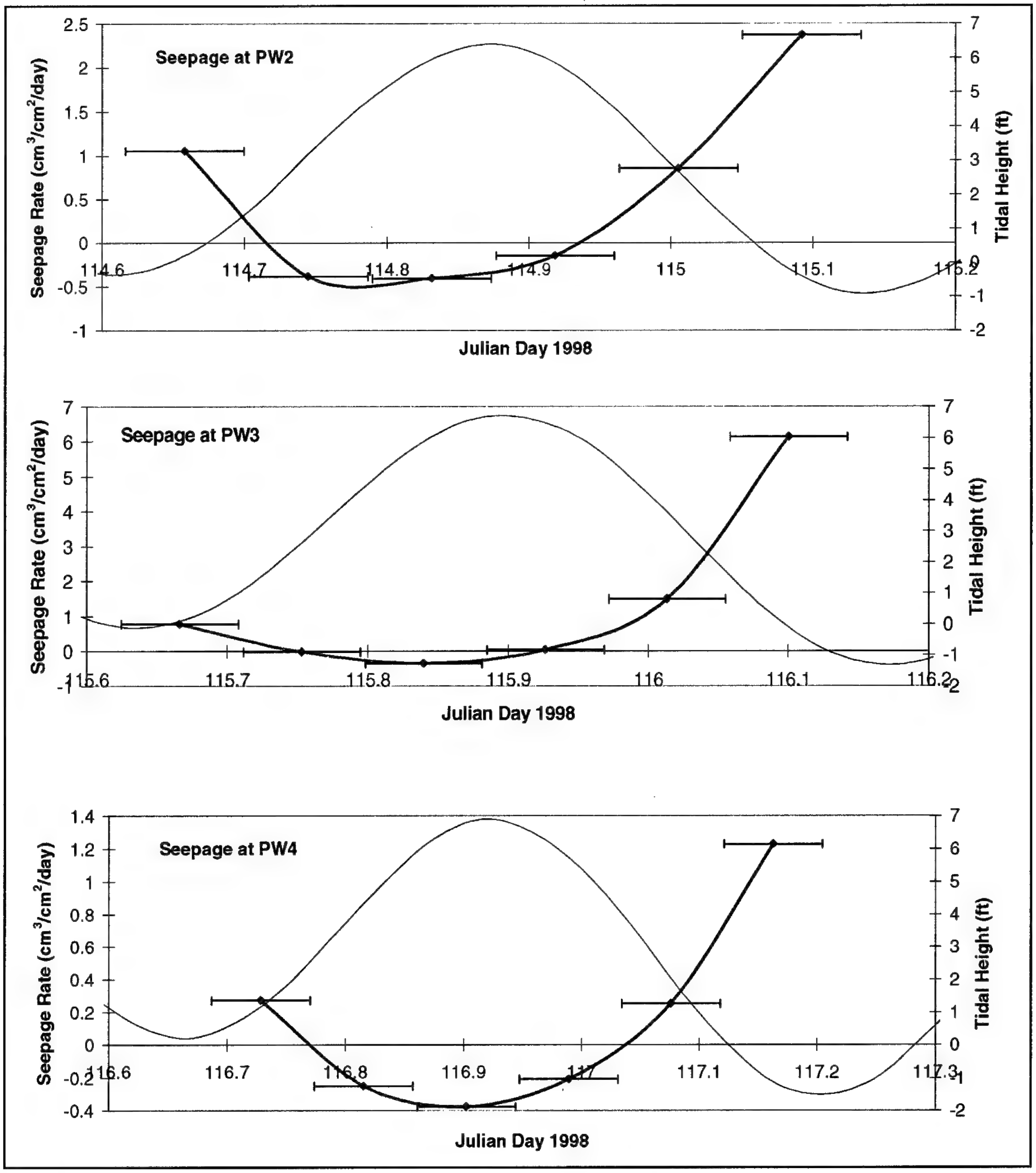
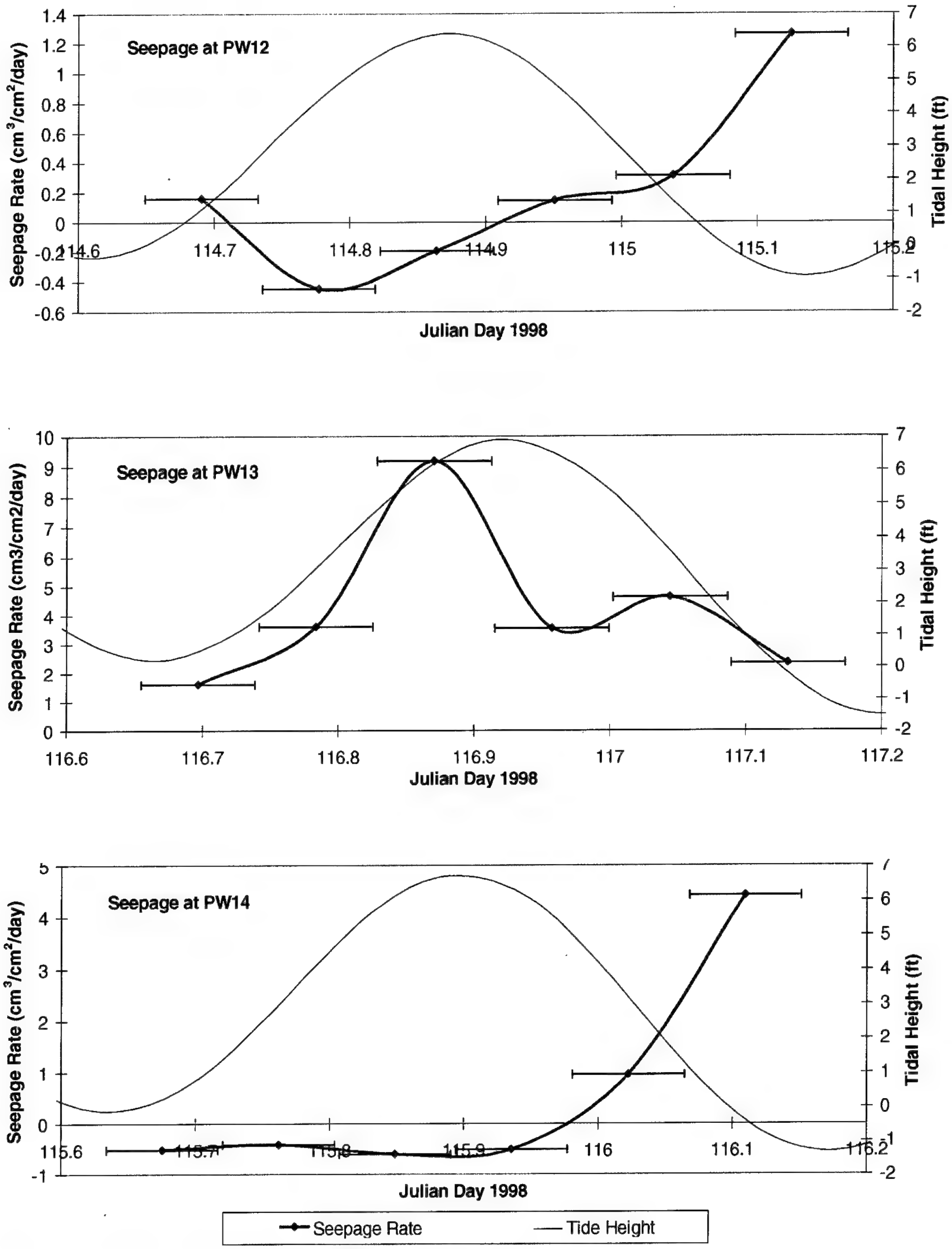


Figure 9. Location of spatial areas assigned to stations PW03, PW04, PW13, and PW14, where VOC fluxes were measured.



Diamond symbols indicate seepage measurement points (each bag)
Horizontal bars indicate sampling period for sample
Red line is a polynomial fit through the measurement points
Black line indicates tidal height during measure ment period (see right axis)

Figure 10. Time-series water seepage results at PW02, PW03, and PW04.



Diamond symbols indicate seepage measurement points (each bag)
Horizontal bars indicate sampling period for sample
Red line is a polynomial fit through the measurement points
Black line indicates tidal height during measure ment period (see right axis)

Figure 11. Time-series water seepage results at PW12, PW13, and PW14.

3.2.2 VOC Flux

To estimate the concentration and flux of VOCs migrating out of the sediment, individual seepage samples were chemically analyzed. Only samples where positive seepage occurred were analyzed, and for all other samples, the VOC content was assumed to be zero. Table 5 lists samples that had sufficient positive seepage to warrant chemical analysis.

Table 5. Sample analysis matrix for six flux stations at Bravo Pier.

	Station					
Bag	PW02	PW03	PW04	PW12	PW13	PW14
1	X	X	X	X	X	
2					X	
3					X	
4					X	
5	X	X	X	X	X	X
6	X	X	X	*	X	X

X Indicates bags for which chemical analyses were performed
* Indicates bag was submitted for analysis but analytical laboratory determined insufficient volume

The primary analytes of interest for this study were TCE and selected degradation products: 1,1-DCE, 1,2-DCE, and VC. Although a complete VOC scan was run, this report only lists results for these compounds. Appendix A includes the complete analytical result list. Table 6 shows the results for chemical analyses at the flux stations. Note that all of the seepage sample results were J-flagged because the laboratory was unable to analyze the unpreserved tedlar-bag samples within 7 days. The ambient water samples were preserved with hydrochloric acid and analyzed within the 14-day holding time. TCE levels were below reporting limits (0.5 µg/L) in all samples at all stations except PW02 and PW03. 1,1-DCE was found in the samples at stations PW02, PW03, and PW13. 1,2-DCE was found in the samples at stations PW02, PW03, and PW13, and at very low levels in some of the samples at stations PW04 and PW12 (the data from PW04 and PW12 were insufficient to calculate fluxes). VC was found in the samples at stations PW02, PW03, PW13, and PW14. Figures 12 through 15 show the time variation of 1,1-DCE, 1,2-DCE, VC, and TCE at stations PW02, PW03, PW13, and PW14.

Table 6. VOC concentrations in sample bags from flux measurements at stations PW02, PW03, PW04, PW12, PW13, and PW14. All concentrations are in μg/L.

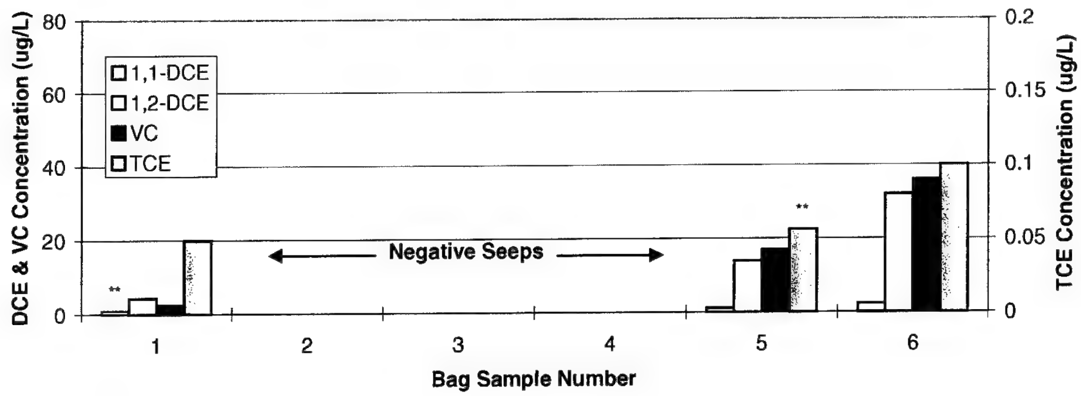
Station	Analyte	Ambient	Sample Bag					
			1	2	3	4	5	6
PW02	TCE	0.1	0.05 J	NA	NA	NA	ND/0.056[1]	0.1 J
	1,2-DCE	7.9	4.4 J	NA	NA	NA	14 J	32 J
	1,1-DCE	2.1	0.9 J	NA	NA	NA	1.2 J	2.4 J
	VC	0.6	2.6 J	NA	NA	NA	17 J	36 J
PW03	TCE	ND	ND/0.004[1]	NA	NA	NA/0.0004[4]	ND/0.025[1]	0.05[3] J
	1,2-DCE	ND	11 J	NA	NA	NA/1.05[4]	74 J	150 J
	1,1-DCE	ND	3.5 J	NA	NA	NA/ 0.33[4]	24 J	42 J
	VC	ND	1.6 J	NA	NA	NA/0.15[4]	11 J	20 J
PW04	TCE	ND	ND	NA	NA	NA	ND	ND
	1,2-DCE	ND	ND	NA	NA	NA	ND	0.4 J
	1,1-DCE	ND	ND	NA	NA	NA	ND	ND
	VC	ND	ND	NA	NA	NA	ND	ND
PW12	TCE	ND	ND	NA	NA	NA	ND	NA
	1,2-DCE	3.1	0.5 J	NA	NA	NA	0.2 J	NA
	1,1-DCE	0.9	ND	NA	NA	NA	ND	NA
	VC	0.7	ND	NA	NA	NA	ND	NA
PW13	TCE	ND	ND	ND	ND	ND	ND	ND
	1,2-DCE	ND	3.1 J	7.9 J	8.7 J	5.2 J	5.1 J	4.1 J
	1,1-DCE	ND	1.8 J	5.1 J	5.4 J	3.5 J	3.4 J	2.8 J
	VC	ND	0.6 J	1.4 J	1.4 J	1 J	1 J	1 J
PW14	TCE	ND	NA	NA	NA	NA	ND	ND
	1,2-DCE	ND	NA	NA	NA	NA	ND	ND
	1,1-DCE	ND	NA	NA	NA	NA	ND	ND
	VC	ND	NA	NA	NA	NA	0.2 J	0.4 J

ND = below reporting limit (<0.5 μg/L)
NA = not analyzed
[1] Sample was ND, concentration was back estimated from TCE:1,2-DCE ratio in sample 6
[2] Sample was ND, concentration was back estimated from 1,1-DCE:1,2-DCE ratio in sample 6
[3] Concentration detected in one of two duplicates, second sample was ND
[4] Sample was NA, concentration was estimated so that seepage concentration was equal to mean seepage concentration for the entire time series
NOTE: All bag samples were J-flagged because analysis exceeded 7-day holding time. Preserved ambient samples were analyzed within the 14-day holding time

The chemical analysis results were used to estimate the concentration and flux of the groundwater seeping into the bay in the Bravo Pier vicinity. Flux estimates were made for stations PW02 (all analytes), PW03 (all analytes), PW13 (all analytes except TCE) and PW14 (VC only). VOCs reported at PW04 and PW12 were insufficient to estimate fluxes. The estimation of seepage concentrations is based on the simultaneous solution of mass balance equations for the flux chamber and the sample bags as shown schematically in figure 16. This calculation's primary assumptions are that the concentration in the bag and the tubing between the valve and bag (V_b) is uniform, and similarly, that the concentration in the flux chamber and tubing between the flux chamber and the valve (V_c) is uniform. Another assumption was that the concentration of 1,1-DCE and TCE in samples where outward seepage was measured but the concentration was below the reporting limit were estimated based on the 1,1-DCE:1,2-DCE and TCE:1,2-DCE ratios from samples where levels were reported (see table 6). Finally, for sample bag 4 from PW03, a slight positive seepage was measured; however; the sample was not analyzed for VOCs. To calculate concentration and flux, the VOC concentrations in this sample (C_b) were adjusted such that the estimated seepage concentration (C_s) for that sample was equal to the mean seepage concentration for the entire time series.

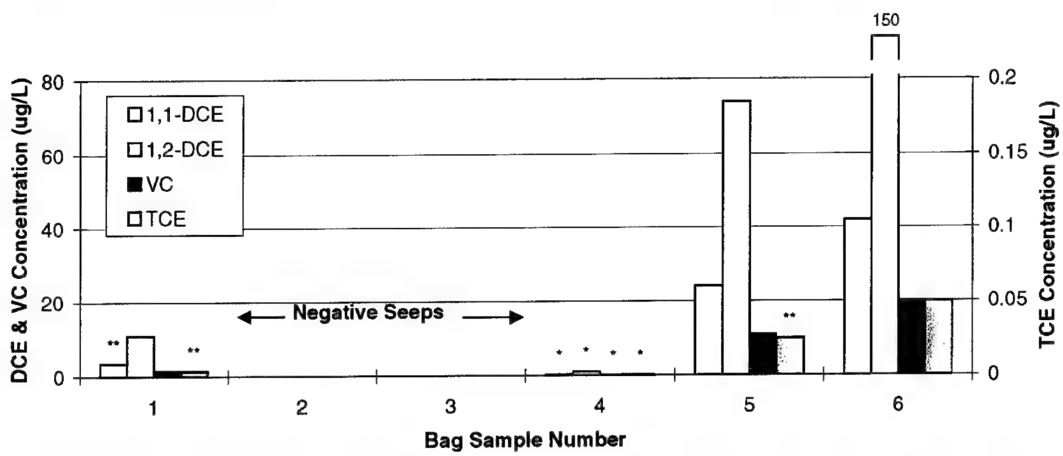
Table 7 shows mass balance analysis results. Calculated seep water concentrations of TCE were generally less than 1 µg/L. Because some of these concentrations were calculated from sample concentrations that were below reporting limits, they should be viewed as estimates. In this sense, they are generally consistent with the results from the porewater analysis that showed unreportable TCE levels in the near-surface porewater (1-ft depth) and concentraations of 34 to 180 µg/L at a 5-ft depth. Because the measured ambient water concentration (0.1 µg/L) was higher than the bag concentration (0.05 µg/L), the calculated concentration was negative. It appears that this higher concentration is primarily an artifact of the analytical resolution. Negative values were assumed to be zero when calculating average seepage concentrations.

In general, the highest seep water concentrations were found at stations PW02 and PW03. Calculated concentrations of 1,1-DCE ranged from a low of 2.5 µg/L to a high of 243 µg/L. The highest 1,1-DCE level was observed in sample 5 from PW03. Calculated concentrations of 1,2-DCE ranged from a low of 3.0 µg/L to a high of 746 µg/L. As with 1,1-DCE, the highest 1,2-DCE level was observed in sample 5 from PW03. Calculated concentrations of VC ranged from 0.74 to 362 µg/L. The highest VC level was observed in sample 5 at PW02. As with TCE, the observed concentrations of 1,1-DCE, 1,2-DCE, and VC tend to fall between the surface and deep concentrations measured in the porewater samples, the exception being PW13, where 1,1-DCE and 1,2-DCE were detected in the seepage water but not in the porewater.



** Indicates ND, concentration estimated (see table 6).

Figure 12. Time variation of 1,1-DCE, 1,2-DCE, VC, and TCE in bag samples at PW02.



* Indicates NA, concentration estimated. ** Indicates ND, concentration estimated (see table 6).

Figure 13. Time variation of 1,1-DCE, 1,2-DCE, VC, and TCE in bag samples at PW03.

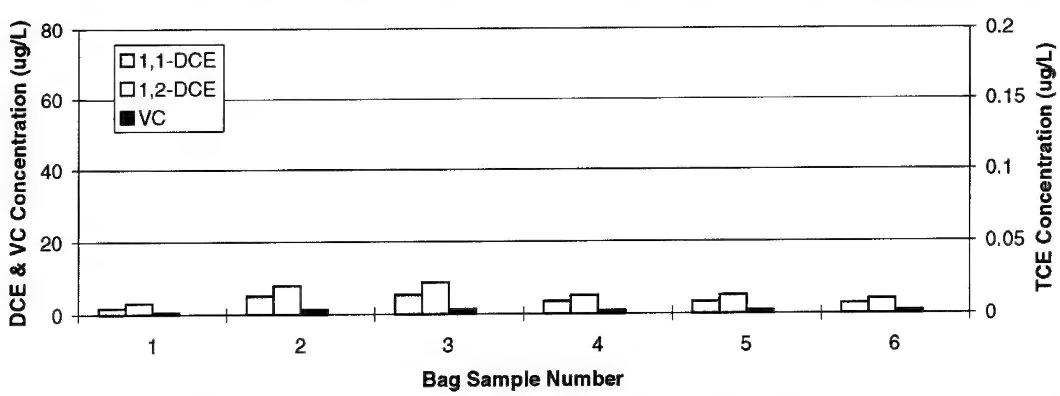


Figure 14. Time variation of 1,1-DCE, 1,2-DCE, and VC in bag samples at PW13. TCE was not detected in bag samples at PW13.

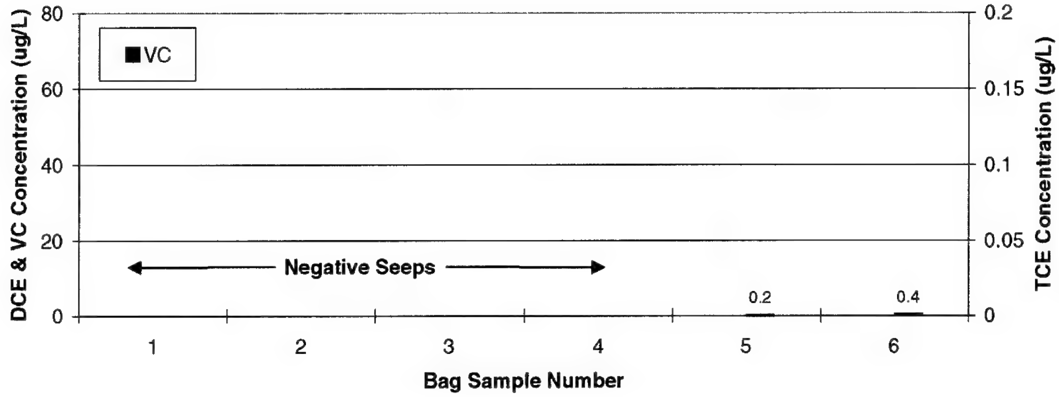


Figure 15. Time variation of VC in the bag samples at PW14. 1,1-DCE, 1,2-DCE, and TCE were not detected in the bag samples at PW14.

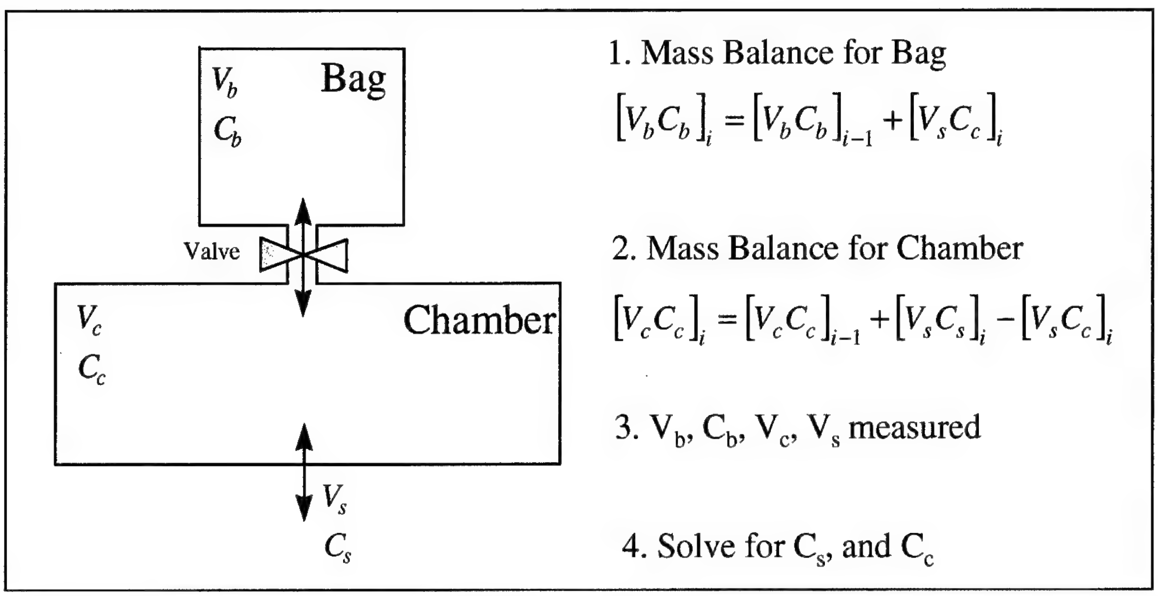


Figure 16. Schematic of mass balance solution for determining VOC concentration (C_s) in seepage water based on measured values of bag volume (V_b), bag concentration (C_b), chamber volume (V_c), and seepage volume (V_s).

Table 7. Calculated outward seepage water VOC concentrations at stations PW02, PW03, PW13, and PW14. All concentrations are in µg/L.

Station	Analyte	Sample Bag 1	2	3	4	5	6	Mean
PW02	TCE	-0.06[3]	-	-	-	0.40[1]	0.26	0.22
	1,2-DCE	3.7	-	-	-	255	116	151
	1,1-DCE	-4.0[3]	-	-	-	12	7.5	6
	VC	43	-	-	-	362	121	177
PW03	TCE	0.11[1]	-	-	0.15[2]	0.25[1]	0.09	.15
	1,2-DCE	324	-	-	446[2]	746	268	666
	1,1-DCE	103	-	-	138[2]	243	67	138
	VC	47	-	-	64[2]	111	33	92
PW13	TCE	-	-	-	-	-	-	-
	1,2-DCE	35	24	9.3	-3.0	5.1	3.0	14
	1,1-DCE	20	16	5.5	-0.56	3.3	2.5	9
	VC	6.7	4.0	1.3	0.30	1.1	2.0	3.3
PW14	TCE	-	-	-	-	-	-	-
	1,2-DCE	-	-	-	-	-	-	-
	1,1-DCE	-	-	-	-	-	-	-
	VC	-	-	-	-	4.23	0.74	1.7

[1]Indicates seepage concentrations estimated, actual bag concentration was ND
[2]Indicates seepage concentrations estimated as mean of overall seepage concentration
[3]Seepage concentration estimated as negative because of elevated ambient level

The time series seep water concentrations presented in table 7 were used to calculate mean seep concentrations for the periods of outward seepage. These mean concentrations were then combined with the outward water seepage measurements (table 3) to estimate VOC fluxes to San Diego Bay. To estimate fluxes to the bay, a surface area was assigned to each station representing an area of the bay bottom that approximately bisects the distance between stations (see figure 9 and table 4). Figure 17 shows the outward seepage rates and mean VOC concentrations at stations PW02, PW03, PW13, and PW14 where VOC fluxes were detected. Mean outward seepage flows were 2.7 and 5.4 gal/min at stations PW02 and PW03 respectively. Table 8 lists estimated flux rates. To extrapolate these results to an annual VOC loading, one must account for the tidal range. The measurements were conducted during strong spring tides, with an average tidal range of about 7.5 ft. The average tidal range for San Diego Bay is about 5.6 ft (Peeling, 1974). To account for this difference, the fluxes were assumed to scale linearly with tidal range. Table 8 also lists flux rates and estimated annual VOC loading to San Diego Bay scaled for the effect of tidal range.

Table 8. VOC flux rates and annual VOC loading to San Diego Bay from seepage in Bravo Pier area.

Parameter	Units	PW02	PW03	PW13	PW14	Total
TCE Flux	mg/day	3.3	4.4	-	-	7.7
1,1-DCE Flux	mg/day	96	4043	1134	-	5273
1,2-DCE Flux	mg/day	1868	13107	1871	-	16845
VC Flux	mg/day	2616	1875	427	21	4938
Tide Scaled TCE Flux	mg/day	2.5	3.3	-	-	5.8
Tide Scaled 1,1-DCE Flux	mg/day	72	3019	847	-	3937
Tide Scaled 1,2-DCE Flux	mg/day	1394	9786	1397	-	12578
Tide Scaled VC Flux	mg/day	1954	1400	319	15	3687
Annual TCE Loading	**g**	**0.90**	**1.2**	**-**	**-**	**1.2**
Annual 1,1-DCE Loading	**g**	**26**	**1102**	**309**	**-**	**1437**
Annual 1,2-DCE Loading	**g**	**509**	**3572**	**510**	**-**	**4591**
Annual VC Loading	**g**	**713**	**511**	**116**	**5.6**	**1346**
% Total TCE Loading		42.9%	57.1%	-	-	-
% Total 1,1-DCE Loading		1.8%	76.7%	21.5%	-	-
% Total 1,2-DCE Loading		11.1%	77.8%	11.1%	-	-
% Total VC Loading		53.0%	38.0%	8.6%	0.4%	-

The flux measurements indicate that the largest influx of TCE, 1,1-DCE, and 1,2-DCE occurs at PW03. Figures 18 through 19 show the spatial distribution of tide-scaled VOC fluxes. The largest influx of VC occurs at PW02. Overall, the largest VOC flux to the bay is for 1,2-DCE with an estimated total annual input of about 4.6 kg, followed by 1,1-DCE with 1.4 kg, VC with 1.3 kg, and TCE with 0.001 kg (1.2 g). Based on the low/undetectable levels of VOCs in ambient bay water, the relatively high solubility of the target VOCs (TCE:1200 mg/L versus Benzo (a) Pyrene (BAP):0.0038 mg/L), and the close proximity to the mouth of the bay, it appears likely that any materials entering the bay at this site are rapidly flushed to the ocean. However, the potential for localized effects on infaunal organisms near PW02 and PW03 does exist and should be evaluated. The results presented here should be confirmed by further sampling at the site using the same methods. Given that the location, timing, and strength of the VOC input is confirmed, it would be possible to model the concentration field and fate of these materials within the bay using the existing TRIM model available at SSC San Diego.

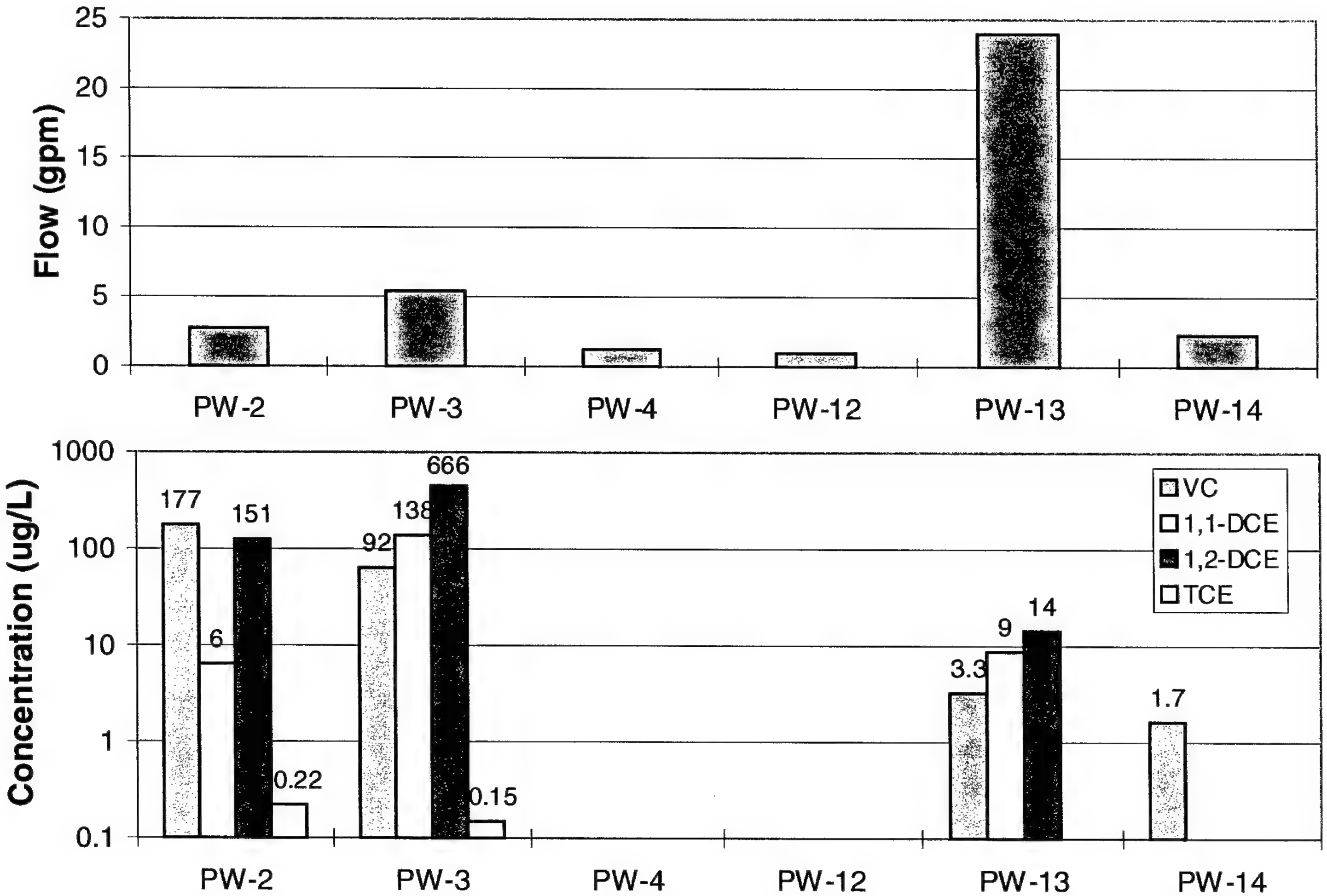


Figure 17. Outward seepage flow (above) and mean outward seepage VOC concentrations (below).

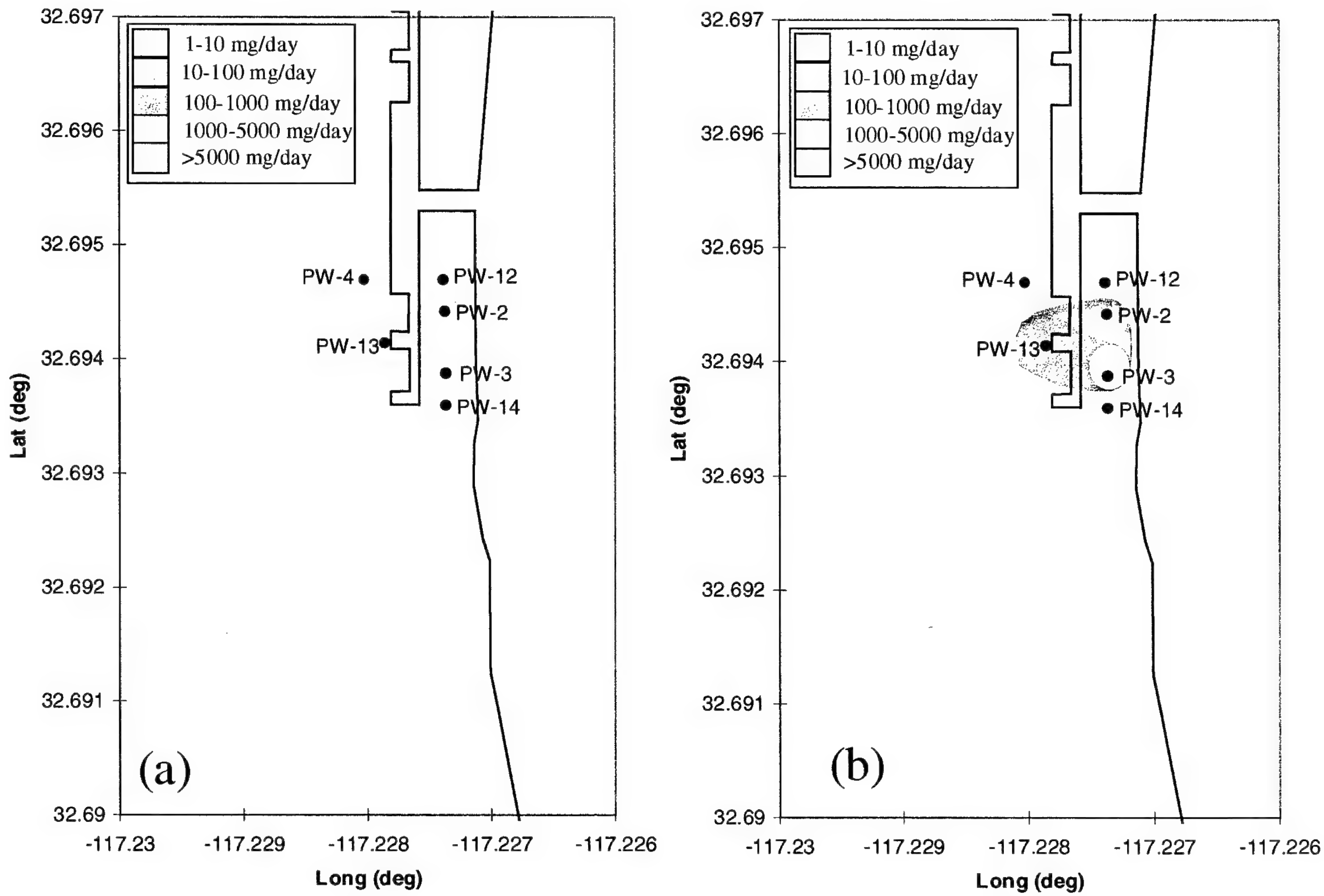


Figure 18. Spatial distribution of TCE (a) and 1,1-DCE (b) tide-scaled fluxes in Bravo Pier vicinity.

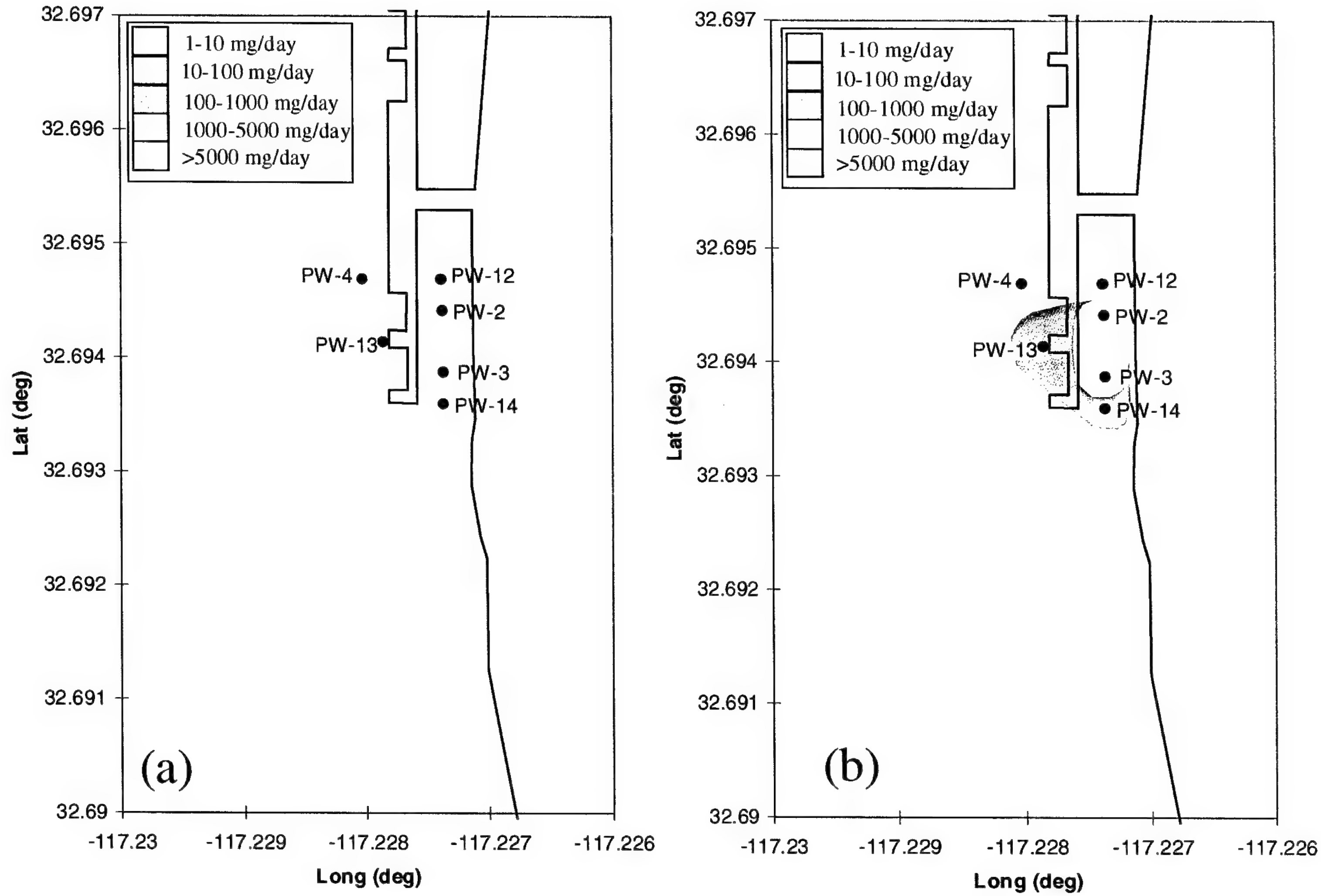


Figure 19. Spatial distribution of 1,2-DCE (a) and VC (b) tide-scaled fluxes in Bravo Pier vicinity.

3.3 ANCILLARY MEASUREMENTS

The following sections present results from the CTD and bathemetric surveys.

3.3.1 CTD

The CTD was deployed with the flux chamber at stations PW02, PW03, and PW04. Measurements of conductivity, temperature, and pressure (depth) were recorded through the duration of the flux chamber deployment (about 12 hours). Salinity levels were calculated from the measured conductivity and temperature, and density was then calculated from salinity and temperature. Figures 20 through 22 show the results are shown in Figures 20-22. The pressure signals closely match the predicted tidal heights obtained from the tidal prediction program, TIDE-1 (figures 10 and 11). In each case, the water depth at each station started near low water, increased through the flood tide, decreased through the ebb, and returned to low water.

Salinity generally ranged from about 33 to 33.5 ppt. Salinity was lowest at low water, increased over a period of about 3 hours, and then remained fairly constant over about 6 hours until falling again near the end of the ebb tide. Low salinities at low water are probably caused by freshwater inputs to the back bay being drawn out past the study site with the ebb tide, as opposed to the localized influence of groundwater seepage. This conclusion is supported by measurements of the salinity distribution in San Diego Bay from a subsequent study during January 1999 that shows decreasing salinities in the inner part of the bay (figure 23). Water temperatures ranged from about 16° to 17.5°C with warmest temperatures generally occurring at low water. This is also likely to result from warm, back bay water flowing out during the ebb tide (figure 23). Density generally ranged from about 1023.5 kg/m^3 to 1024.5 kg/m^3 (note that density anomaly plotted in figures 20 though 22 is density-1000). Low densities observed during low water appear to result from the combined effect of warmer temperatures and lower salinities that co-occur during low water. However, the overall tidal variation in ambient density is fairly small, and unlikely to significantly influence the hydraulic gradients at the study site that appear to be dominated by tidal height.

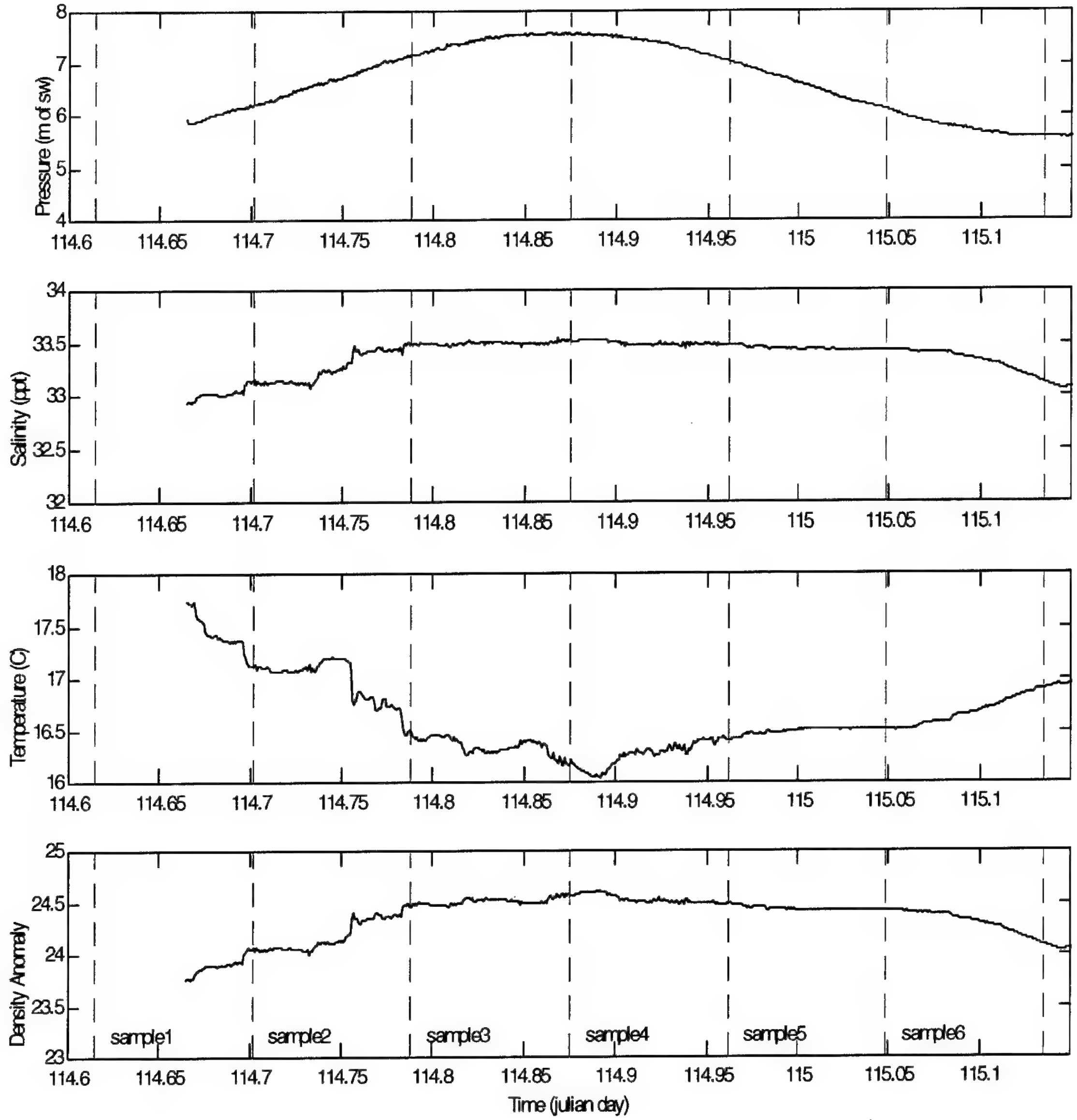


Figure 20. Pressure, salinity, temperature, and density measurements from PW02 CTD data.

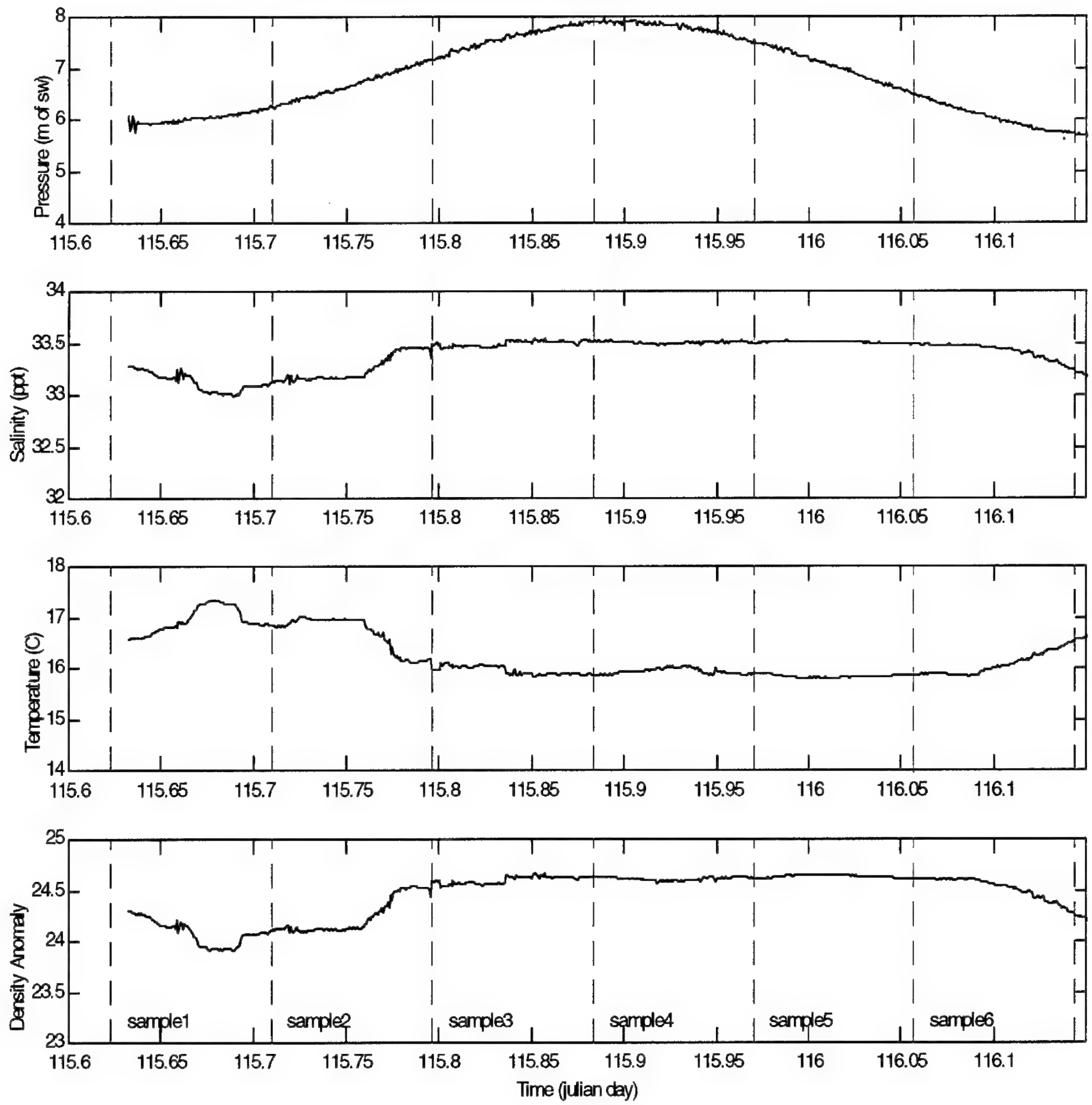


Figure 21. Pressure, salinity, temperature, and density measurements from PW03 CTD data.

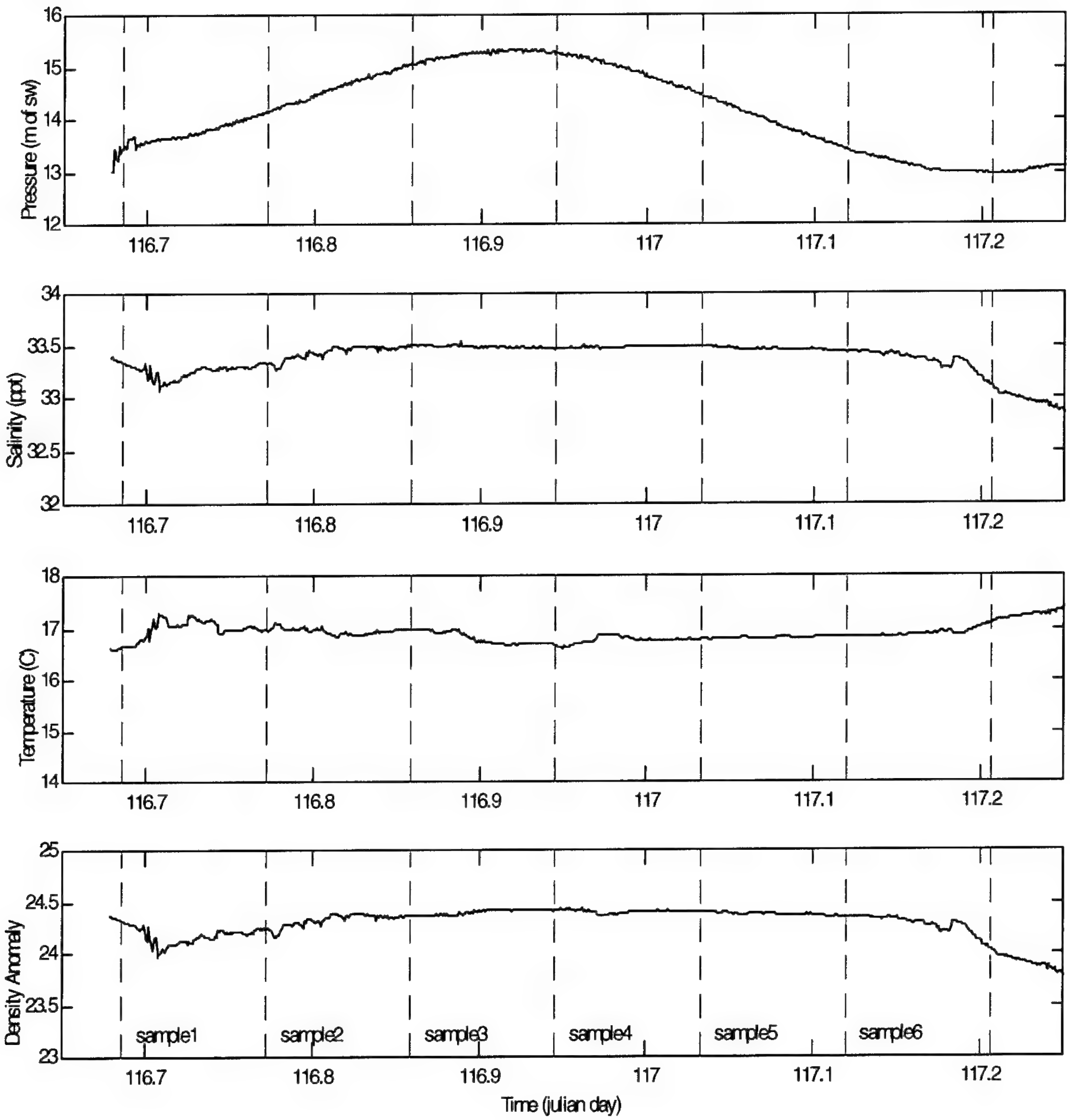


Figure 22. Pressure, salinity, temperature, and density measurements from PW04 CTD data.

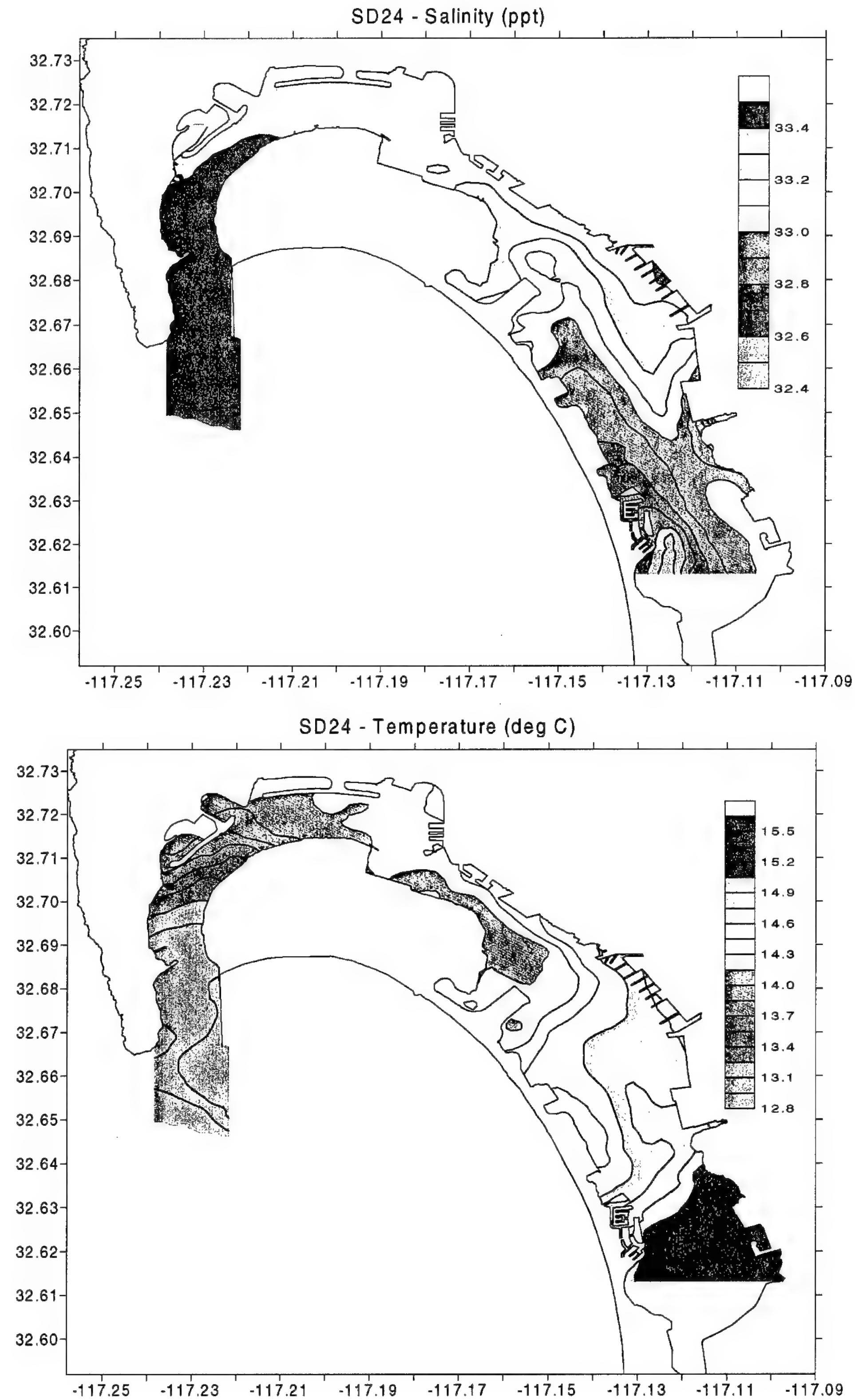


Figure 23. Spatial distribution of salinity and temperature during winter in San Diego Bay (January 1999).

3.3.2 Bathymetry

Figure 24 shows results from the bathymetric mapping. Measured water depths were corrected to MLLW using tide height corrections generated from the tidal prediction program, TIDE-1. Depths were then contoured over the survey area. The survey was performed during high tide; some areas near the shore were difficult to approach. In addition, the shoreline map in figure 23 is only approximate. For this reason, the depth contours near the shore should not be taken literally. The results reflect the main features found on the local navigational chart, with a deep channel running mid-bay and a deep-water region that cuts eastward from the main channel into the area off Bravo Pier. The topography is fairly steep in the region inshore from the pier and rises into shallow water near the shore. Along the shoreline, the shallowest regions are found to the north and south of Bravo Pier, with somewhat deeper water between the pier and the shore.

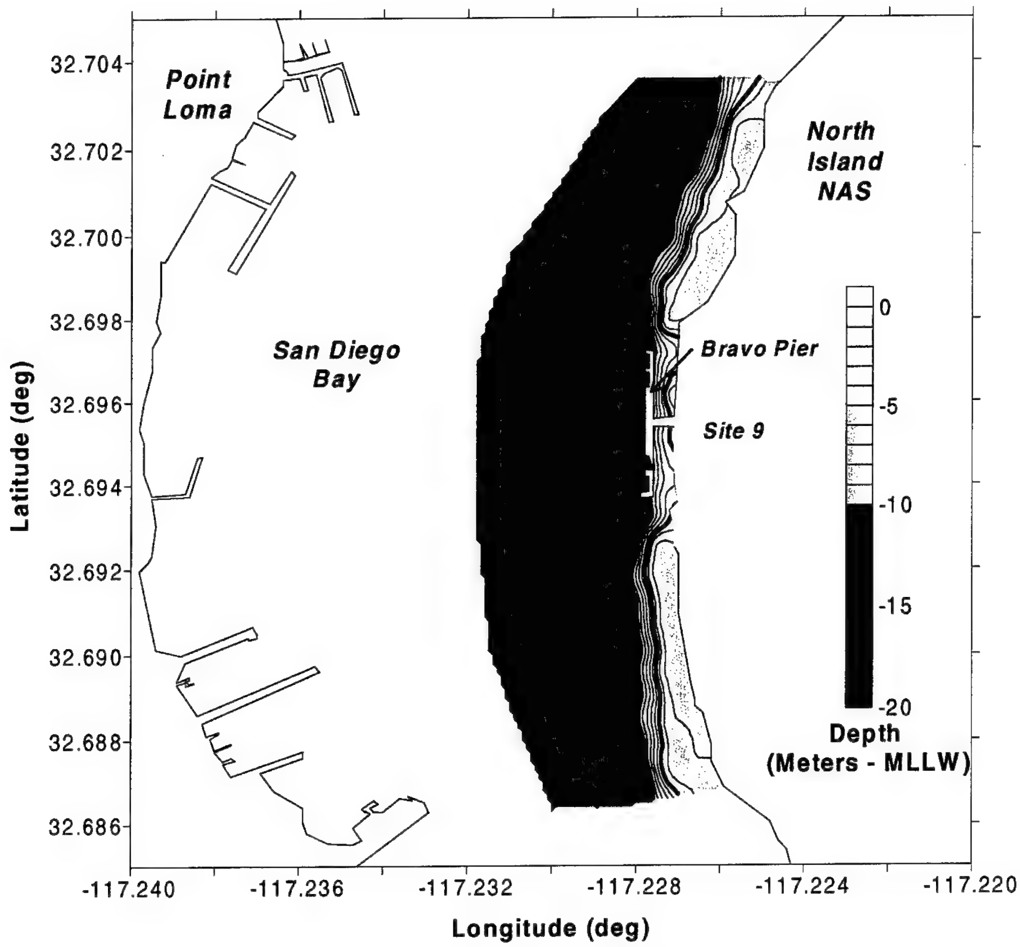


Figure 24. Contours of bottom depth relative to MLLW in Bravo Pier vicinity.

4. CONCLUSIONS

Measurements of porewater at 20 offshore stations at North Island IR Site 9 indicate that elevated levels of VOCs are present in a tightly restricted area near the southern reach of Bravo Pier. The highest levels were always observed at the deepest measurement points (5 ft versus 1 ft below bay bottom), indicating that the concentrations are significantly attenuated within the sediment prior to entering the bay. In addition, the primary VOCs observed were 1,1-DCE, 1,2-DCE, and VC, indicating that degradation of the TCE source product is occurring before the material reaches the bay.

Measurements of water seepage and VOC fluxes at six offshore stations where elevated VOCs were observed indicate that fluxes of VOCs to the bay are limited primarily to the areas around PW02 and PW03 between Bravo Pier and the shore. Seepage measurements show that the flux is driven largely by a tidal pumping of the porewater in which porewater with elevated VOC levels migrates out during low water, and bay water with undetectable VOC levels returns to the sediment during high water. The flux measurements indicate that overall, the largest VOC flux to the bay is for 1,2-DCE, with an estimated total annual input of about 4.6 kg, followed by 1,1-DCE with 1.4 kg, VC with 1.3 kg, and TCE with 0.001 kg (1.2 g).

Based on the low or undetectable levels of VOCs in ambient bay water, the relatively high solubility of the target VOCs (TCE:1200 mg/L versus BAP:0.0038 mg/L), and the close proximity to the mouth of the bay, it appears likely that any materials entering the bay at this site are rapidly flushed to the ocean. However, the potential for localized effects on infaunal organisms near PW02 and PW03 does exist and should be evaluated.

5. REFERENCES

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APPENDIX A

LABORATORY ANALYSIS DATA

ANALYTE_NAME	UNITS	PW-1 147P011 REG 2/9/98	PW-1 147P015 REG 2/9/98	PW-2 147B021 REG 4/25/98	PW-2 147B025 REG 4/25/98	PW-2 147B026 REG 4/25/98
1,1,1,2-TETRACHLOROETHANE	UG/L	.5 U	.5 U	.5 UJ	.5 UJ	.5 UJ
1,1,1-TRICHLOROETHANE	UG/L	.5 U	.5 U	.5 UJ	.5 UJ	.5 UJ
1,1,2,2-TETRACHLOROETHANE	UG/L	.5 U	.5 U	.5 UJ	.5 UJ	.5 UJ
1,1,2-TRICHLOROETHANE	UG/L	.5 U	.5 U	.5 UJ	.5 UJ	.5 UJ
1,1-DICHLOROETHANE	UG/L	.2 J	11	.5 UJ	1 J	2.1 J
1,1-DICHLOROETHENE	UG/L	.5 U	.5 U	.9 J	1.2 J	2.4 J
1,1-DICHLOROPROPENE	UG/L	.5 U	.5 U	.5 UJ	.5 UJ	.5 UJ
1,2,3-TRICHLOROBENZENE	UG/L	2 U	2 U	2 UJ	2 UJ	2 UJ
1,2,3-TRICHLOROPROPANE	UG/L	.5 U	.5 U	.5 UJ	.5 UJ	.5 UJ
1,2,4-TRICHLOROBENZENE	UG/L	2 U	2 U	2 UJ	2 UJ	2 UJ
1,2,4-TRIMETHYLBENZENE	UG/L	2 U	2 U	2 UJ	2 UJ	2 UJ
1,2-DIBROMO-3-CHLOROPROPANE	UG/L	2 U	2 U	2 UJ	2 UJ	2 UJ
1,2-DIBROMOETHANE	UG/L	2 U	2 U	2 UJ	2 UJ	2 UJ
1,2-DICHLOROBENZENE	UG/L	.5 U	3.7	.5 UJ	.5 UJ	.5 UJ
1,2-DICHLOROETHANE	UG/L	.5 U	.3 J	.5 UJ	.5 UJ	.5 UJ
1,2-DICHLOROETHYLENE	UG/L	.5 U	.6	4.4 J	14 J	32 J
1,2-DICHLOROPROPANE	UG/L	.5 U	.5 U	.5 UJ	.5 UJ	.5 UJ
1,3,5-TRIMETHYLBENZENE	UG/L	2 U	2 U	2 UJ	2 UJ	2 UJ
1,3-DICHLOROBENZENE	UG/L	.5 U	.5 U	.5 UJ	.5 UJ	.5 UJ
1,3-DICHLOROPROPANE	UG/L	.5 U	.5 U	.5 UJ	.5 UJ	.5 UJ
1,4-DICHLOROBENZENE	UG/L	.5 U	.5 U	.09 J	.1 J	.1 J
2-BUTANONE	UG/L	20 U	20 U	20 UJ	20 UJ	20 UJ
2-CHLOROTOLUENE	UG/L	2 U	2 U	2 UJ	2 UJ	2 UJ
2-HEXANONE	UG/L	20 U	20 U	20 UJ	20 UJ	20 UJ
4-CHLOROTOLUENE	UG/L	2 U	2 U	2 UJ	2 UJ	2 UJ
4-METHYL-2-PENTANONE	UG/L	20 U	20 U	20 UJ	20 UJ	20 UJ
ACETONE	UG/L	7 J	6 J			
BENZENE	UG/L	.5 U	.07 J	.5 UJ	.5 UJ	.5 UJ
BROMOBENZENE	UG/L	.5 U	.5 U	.5 UJ	.5 UJ	.5 UJ
BROMOCHLOROMETHANE	UG/L	.5 U	.5 U	.5 UJ	.5 UJ	.5 UJ
BROMODICHLOROMETHANE	UG/L	.5 U	.5 U	.1 J	.5 UJ	.5 UJ
BROMOFORM	UG/L	.5 U	.5 U	.5 UJ	.5 UJ	.5 UJ
BROMOMETHANE	UG/L	.5 U	.5 U	.5 UJ	.5 UJ	.5 UJ
CARBON DISULFIDE	UG/L	.5 UJ	.5 UJ	.5 UJ	.2 J	.5 UJ
CARBON TETRACHLORIDE	UG/L	.5 U	.5 U	.5 UJ	.5 UJ	.5 UJ
CHLOROBENZENE	UG/L	.5 U	.5 U	.5 UJ	.5 UJ	.5 UJ
CHLORODIBROMOMETHANE	UG/L	.5 U	.5 U	.5 UJ	.5 UJ	.5 UJ
CHLOROETHANE	UG/L	.5 U	.5 U	.5 UJ	.5 UJ	.5 UJ
CHLOROFORM	UG/L	.5 U	.5 U	.2 J	.5 UJ	.5 UJ
CHLOROMETHANE	UG/L	.5 U	.1 J	.5 UJ	.5 UJ	.5 UJ
CIS-1,3-DICHLOROPROPENE	UG/L	.5 U	.5 U	.5 UJ	.5 UJ	.5 UJ
DIBROMOMETHANE	UG/L	.5 U	.5 U	.5 UJ	.5 UJ	.5 UJ
DICHLORODIFLUOROMETHANE	UG/L	.5 UJ	.5 UJ	.5 UJ	.5 UJ	.5 UJ
ETHYLBENZENE	UG/L	.5 U	.5 U	.5 UJ	.5 UJ	.5 UJ
HEXACHLOROBUTADIENE	UG/L	2 U	2 U	2 UJ	2 UJ	2 UJ
ISOPROPYLBENZENE	UG/L	2 U	2 U	2 UJ	2 UJ	2 UJ
METHYLENE CHLORIDE	UG/L	1 U	1 U	1 UJ	1 UJ	1 UJ
N-BUTYLBENZENE	UG/L	2 U	2 U	2 UJ	2 UJ	2 UJ
N-PROPYLBENZENE	UG/L	2 U	2 U	2 UJ	2 UJ	2 UJ
NAPHTHALENE	UG/L	2 U	2 U	2 UJ	2 UJ	2 UJ
P-ISOPROPYLTOLUENE	UG/L	2 U	2 U	2 UJ	2 UJ	2 UJ
SEC-BUTYLBENZENE	UG/L	2 U	2 U	2 UJ	2 UJ	2 UJ
SEC-DICHLOROPROPANE	UG/L	.5 U	.5 U	.5 UJ	.5 UJ	.5 UJ
STYRENE	UG/L	.5 U	.5 U	.5 UJ	.5 UJ	.5 UJ
TERT-BUTYLBENZENE	UG/L	2 U	2 U	2 UJ	2 UJ	2 UJ
TETRACHLOROETHENE	UG/L	.5 U	.5 U	.5 UJ	.5 UJ	.5 UJ
TOLUENE	UG/L	.5 U	.5 U	.3 J	.4 J	.3 J
TOTAL XYLENES	UG/L	.5 U	.5 U	.5 UJ	.5 UJ	.5 UJ
TRANS-1,3-DICHLOROPROPENE	UG/L	.5 U	.5 U	.5 UJ	.5 UJ	.5 UJ
TRICHLOROETHENE	UG/L	.5 U	.5 U	.05 J	.5 UJ	.1 J
TRICHLOROFLUOROMETHANE	UG/L	.5 U	.5 U	.5 UJ	.5 UJ	.5 UJ
VINYL CHLORIDE	UG/L	.5 U	.5 U	2.6 J	17 J	36 J

ANALYTE_NAME	UNITS	PW-2 147BW02 AB 4/25/98	PW-2 147P021 REG 2/10/98	PW-2 147P025 REG 2/10/98	PW-3 147B031 REG 4/26/98	PW-3 147B035 REG 4/26/98
1,1,1,2-TETRACHLOROETHANE	UG/L	.5 U	.5 U	.5 U	.5 UJ	.5 UJ
1,1,1-TRICHLOROETHANE	UG/L	.5 U	.5 U	.5 U	.5 UJ	.5 UJ
1,1,2,2-TETRACHLOROETHANE	UG/L	.5 U	.5 U	.5 U	.5 UJ	.5 UJ
1,1,2-TRICHLOROETHANE	UG/L	.5 U	.5 U	11	.5 UJ	.5 UJ
1,1-DICHLOROETHANE	UG/L	.5 U	32	58	.5 UJ	.7 J
1,1-DICHLOROETHENE	UG/L	2.1	.5 U	2100	3.5 J	24 J
1,1-DICHLOROPROPENE	UG/L	.5 U	.5 U	.09 J	.5 UJ	.5 UJ
1,2,3-TRICHLOROBENZENE	UG/L	2 U	2 U	2 U	2 UJ	2 UJ
1,2,3-TRICHLOROPROPANE	UG/L	.5 U	.5 U	.5 U	.5 UJ	.5 UJ
1,2,4-TRICHLOROBENZENE	UG/L	2 UJ	2 U	2 U	2 UJ	2 UJ
1,2,4-TRIMETHYLBENZENE	UG/L	2 U	2 U	.2 U	2 UJ	2 UJ
1,2-DIBROMO-3-CHLOROPROPANE	UG/L	2 U	2 U	2 U	2 UJ	2 UJ
1,2-DIBROMOETHANE	UG/L	2 U	2 U	2 U	2 UJ	2 UJ
1,2-DICHLOROBENZENE	UG/L	.5 U	4.2	4	.5 UJ	.5 UJ
1,2-DICHLOROETHANE	UG/L	.5 U	.2 J	18	.5 UJ	.4 J
1,2-DICHLOROETHYLENE	UG/L	7.9	.8	42000	11 J	74 J
1,2-DICHLOROPROPANE	UG/L	.5 U	.5 U	.1 J	.5 UJ	.5 UJ
1,3,5-TRIMETHYLBENZENE	UG/L	2 U	2 U	2 U	2 UJ	2 UJ
1,3-DICHLOROBENZENE	UG/L	.5 U	.2 J	.2 U	.5 UJ	.5 UJ
1,3-DICHLOROPROPANE	UG/L	.5 U	.5 U	.5 U	.5 UJ	.5 UJ
1,4-DICHLOROBENZENE	UG/L	.5 U	.3 J	.4 J	.1 J	.07 J
2-BUTANONE	UG/L	20 U	20 U	20 U	20 UJ	20 UJ
2-CHLOROTOLUENE	UG/L	2 U	2 U	2 U	2 UJ	2 UJ
2-HEXANONE	UG/L	20 U	20 U	20 U	20 UJ	20 UJ
4-CHLOROTOLUENE	UG/L	2 U	2 U	2 U	2 UJ	2 UJ
4-METHYL-2-PENTANONE	UG/L	20 U	20 U	20 U	20 UJ	20 UJ
ACETONE	UG/L		4 J	5 J		9 J
BENZENE	UG/L	.5 U	.1 J	1.2	.5 UJ	.5 UJ
BROMOBENZENE	UG/L	.5 U	.5 U	.5 U	.5 UJ	.5 UJ
BROMOCHLOROMETHANE	UG/L	.5 U	.5 U	.5 U	.5 UJ	.5 UJ
BROMODICHLOROMETHANE	UG/L	.5 U	.5 U	.5 U	.08 J	.5 UJ
BROMOFORM	UG/L	.5 U	.5 U	.5 U	.5 UJ	.5 UJ
BROMOMETHANE	UG/L	.5 U	.5 U	.5 U	.5 UJ	.5 UJ
CARBON DISULFIDE	UG/L	.5 U	.5 UJ	.3 J	.5 UJ	.5 UJ
CARBON TETRACHLORIDE	UG/L	.5 U	.5 U	.5 U	.5 UJ	.5 UJ
CHLOROBENZENE	UG/L	.5 U	.3 J	1.3	.5 UJ	.5 UJ
CHLORODIBROMOMETHANE	UG/L	.5 U	.5 U	.5 U	.5 UJ	.5 UJ
CHLOROETHANE	UG/L	.5 U	1	.5 U	.5 UJ	.5 UJ
CHLOROFORM	UG/L	.5 U	.5 U	.5 U	.08 J	.5 UJ
CHLOROMETHANE	UG/L	.2 J	.5 U	.2 J	.5 UJ	.5 UJ
CIS-1,3-DICHLOROPROPENE	UG/L	.5 U	.5 U	.5 U	.5 UJ	.5 UJ
DIBROMOMETHANE	UG/L	.5 U	.5 U	.5 U	.5 UJ	.5 UJ
DICHLORODIFLUOROMETHANE	UG/L	.5 UJ	.5 U	.5 U	.5 UJ	.6 J
ETHYLBENZENE	UG/L	.5 U	.5 U	8.6	.5 UJ	.5 UJ
HEXACHLOROBUTADIENE	UG/L	2 U	2 U	2 U	2 UJ	2 UJ
ISOPROPYLBENZENE	UG/L	2 U	2 U	.4 J	2 UJ	2 UJ
METHYLENE CHLORIDE	UG/L	1 U	1 U	1 U	1 UJ	.1 J
N-BUTYLBENZENE	UG/L	2 U	2 U	2 U	2 UJ	2 UJ
N-PROPYLBENZENE	UG/L	2 U	2 U	.4 J	2 UJ	2 UJ
NAPHTHALENE	UG/L	2 UJ	2 U	2 U	2 UJ	2 UJ
P-ISOPROPYLTOLUENE	UG/L	2 U	2 U	2 U	2 UJ	2 UJ
SEC-BUTYLBENZENE	UG/L	2 U	2 U	.5 U	2 UJ	2 UJ
SEC-DICHLOROPROPANE	UG/L	.5 U	.5 U	.5 U	.5 UJ	.5 UJ
STYRENE	UG/L	.5 U	.5 U	.5 U	.5 UJ	.5 UJ
TERT-BUTYLBENZENE	UG/L	2 U	2 U	.2 J	2 UJ	2 UJ
TETRACHLOROETHENE	UG/L	.5 U	.5 U	.5 U	.5 UJ	.5 UJ
TOLUENE	UG/L	.2 J	.09 J	37	.3 J	.3 J
TOTAL XYLENES	UG/L	.5 U	.5 U	9.8	.5 UJ	.5 UJ
TRANS-1,3-DICHLOROPROPENE	UG/L	.5 U	.5 U	.5 U	.5 UJ	.5 UJ
TRICHLOROETHENE	UG/L	.1 J	.5 U	180	.5 UJ	.5 UJ
TRICHLOROFLUOROMETHANE	UG/L	.5 U	.5 U	.5 U	.5 UJ	.5 UJ
VINYL CHLORIDE	UG/L	.6	3.3	800	1.6 J	11 J

ANALYTE_NAME	UNITS	PW-3 147B036 REG 4/26/98	PW-3 147BW03 AB 4/25/98	PW-3 147P031 REG 2/10/98	PW-3 147P035 REG 2/10/98	PW-4 147B041 REG 4/27/98
1,1,1,2-TETRACHLOROETHANE	UG/L	.5 UJ	.5 U	.5 U	.5 U	.5 UJ
1,1,1-TRICHLOROETHANE	UG/L	.5 UJ	.5 U	.5 U	.5 U	.5 UJ
1,1,2,2-TETRACHLOROETHANE	UG/L	.5 UJ	.5 U	.5 U	.5 U	.5 UJ
1,1,2-TRICHLOROETHANE	UG/L	.5 UJ	.5 U	.5 U	.5 U	.5 UJ
1,1-DICHLOROETHANE	UG/L	1.2 J	.5 U	.5 U	110	.5 UJ
1,1-DICHLOROETHENE	UG/L	42 J	.5 U	.5 U	9000	.5 UJ
1,1-DICHLOROPROPENE	UG/L	.5 UJ	.5 U	.5 U	.2 J	.5 UJ
1,2,3-TRICHLOROBENZENE	UG/L	2 UJ	2 U	2 U	2 U	2 UJ
1,2,3-TRICHLOROPROPANE	UG/L	.5 UJ	.5 U	.5 U	.5 U	.5 UJ
1,2,4-TRICHLOROBENZENE	UG/L	2 UJ	2 UJ	2 U	2 U	2 UJ
1,2,4-TRIMETHYLBENZENE	UG/L	2 UJ	2 U	2 U	34	2 UJ
1,2-DIBROMO-3-CHLOROPROPANE	UG/L	2 UJ	2 U	2 U	2 U	2 UJ
1,2-DIBROMOETHANE	UG/L	2 UJ	2 U	2 U	2 U	2 UJ
1,2-DICHLOROBENZENE	UG/L	.5 UJ	.5 U	.5 U	39	.5 UJ
1,2-DICHLOROETHANE	UG/L	.8 J	.5 U	.06 J	200	.5 UJ
1,2-DICHLOROETHYLENE	UG/L	150 J	.5 U	1.5	5500	.5 UJ
1,2-DICHLOROPROPANE	UG/L	.5 UJ	.5 U	.5 U	.4 J	.5 UJ
1,3,5-TRIMETHYLBENZENE	UG/L	2 UJ	2 U	2 U	.5 J	2 UJ
1,3-DICHLOROBENZENE	UG/L	.5 UJ	.5 U	.5 U	1.7	.5 UJ
1,3-DICHLOROPROPANE	UG/L	.5 UJ	.5 U	.5 U	.5 U	.5 UJ
1,4-DICHLOROBENZENE	UG/L	.05 J	.5 U	.5 U	2.1	.1 J
2-BUTANONE	UG/L	20 UJ	20 U	2 J	20 U	20 UJ
2-CHLOROTOLUENE	UG/L	2 UJ	2 U	2 U	2 U	2 UJ
2-HEXANONE	UG/L	20 UJ	20 U	20 U	20 U	20 UJ
4-CHLOROTOLUENE	UG/L	2 UJ	2 U	2 U	2 U	2 UJ
4-METHYL-2-PENTANONE	UG/L	20 UJ	20 U	20 U	20 J	3 J
ACETONE	UG/L			6 J	5 J	5 UJ
BENZENE	UG/L	.5 UJ	.5 U	.5 U	3.7	.5 UJ
BROMOBENZENE	UG/L	.5 UJ	.5 U	.5 U	.5 U	.5 UJ
BROMOCHLOROMETHANE	UG/L	.5 UJ	.5 U	.5 U	.5 U	.5 UJ
BROMODICHLOROMETHANE	UG/L	.5 UJ	.5 U	.5 U	.5 U	.2 J
BROMOFORM	UG/L	.5 UJ	.5 U	.5 U	.5 U	.5 UJ
BROMOMETHANE	UG/L	.5 UJ	.5 U	.5 UJ	.5 U	.5 UJ
CARBON DISULFIDE	UG/L	.5 UJ	.5 U	.5 UJ	.3 J	.2 J
CARBON TETRACHLORIDE	UG/L	.5 UJ	.5 U	.5 U	.5 U	.5 UJ
CHLOROBENZENE	UG/L	.5 UJ	.5 U	.5 U	1.6	.5 UJ
CHLORODIBROMOMETHANE	UG/L	.5 UJ	.5 U	.5 U	.5 U	.5 UJ
CHLOROETHANE	UG/L	.5 UJ	.5 U	.5 U	2.1	.5 UJ
CHLOROFORM	UG/L	.5 UJ	.5 U	.5 U	7.8	.3 J
CHLOROMETHANE	UG/L	.5 UJ	.5 U	.1 J	.1 J	.5 UJ
CIS-1,3-DICHLOROPROPENE	UG/L	.5 UJ	.5 U	.5 U	.5 U	.5 UJ
DIBROMOMETHANE	UG/L	.5 UJ	.5 U	.5 U	.5 U	.5 UJ
DICHLORODIFLUOROMETHANE	UG/L	1.1 J	.5 UJ	.5 U	.5 U	.5 UJ
ETHYLBENZENE	UG/L	.5 UJ	.5 U	.5 U	27	.5 UJ
HEXACHLOROBUTADIENE	UG/L	2 UJ	2 U	2 U	2 U	2 UJ
ISOPROPYLBENZENE	UG/L	2 UJ	2 U	2 U	6	2 UJ
METHYLENE CHLORIDE	UG/L	.2 J	1 U	.1 J	3	1 UJ
N-BUTYLBENZENE	UG/L	2 UJ	2 U	2 U	1 J	2 UJ
N-PROPYLBENZENE	UG/L	2 UJ	2 U	2 U	11	2 UJ
NAPHTHALENE	UG/L	2 UJ	2 UJ	2 U	5	2 UJ
P-ISOPROPYLTOLUENE	UG/L	2 UJ	2 U	2 U	3	2 UJ
SEC-BUTYLBENZENE	UG/L	2 UJ	2 U	2 U	2	2 UJ
SEC-DICHLOROPROPANE	UG/L	.5 UJ	.5 U	.5 U	.5 U	.5 UJ
STYRENE	UG/L	.5 UJ	.5 U	.5 U	.5 U	.5 UJ
TERT-BUTYLBENZENE	UG/L	2 UJ	2 U	2 U	.2 J	2 UJ
TETRACHLOROETHENE	UG/L	.5 UJ	.5 U	.5 U	.4 J	.5 UJ
TOLUENE	UG/L	.1 J	.2 J	.05 J	130	.5 UJ
TOTAL XYLENES	UG/L	.5 UJ	.5 U	.5 U	74	.5 UJ
TRANS-1,3-DICHLOROPROPENE	UG/L	.5 UJ	.5 U	.5 U	.5 U	.5 UJ
TRICHLOROETHENE	UG/L	.05 J	.5 U	.5 U	34	.5 UJ
TRICHLOROFLUOROMETHANE	UG/L	.5 UJ	.5 U	.5 U	.5 U	.5 UJ
VINYL CHLORIDE	UG/L	20 J	.5 U	.4 J	12000	.5 UJ

ANALYTE_NAME	UNITS	PW-4 147B045 REG 4/27/98	PW-4 147B046 REG 4/27/98	PW-4 147BW04 AB 4/26/98	PW-4 147P041 REG 2/9/98	PW-4 147P045 REG 2/9/98
1,1,1,2-TETRACHLOROETHANE	UG/L	.5 UJ	.5 UJ	.5 U	.5 U	.5 U
1,1,1-TRICHLOROETHANE	UG/L	.5 UJ	.5 UJ	.5 U	.5 U	.5 U
1,1,2,2-TETRACHLOROETHANE	UG/L	.5 UJ	.5 UJ	.5 U	.5 U	.5 U
1,1,2-TRICHLOROETHANE	UG/L	.5 UJ	.5 UJ	.5 U	.5 U	.5 U
1,1-DICHLOROETHANE	UG/L	.5 UJ	.5 UJ	.5 U	.2 J	53
1,1-DICHLOROETHENE	UG/L	.5 UJ	.5 UJ	.5 U	.5 U	17
1,1-DICHLOROPROPENE	UG/L	.5 UJ	.5 UJ	.5 U	.5 U	.5 U
1,2,3-TRICHLOROBENZENE	UG/L	2 UJ	2 UJ	2 UJ	2 U	2 U
1,2,3-TRICHLOROPROPANE	UG/L	.5 UJ	.5 UJ	.5 U	.5 U	.5 U
1,2,4-TRICHLOROBENZENE	UG/L	2 UJ	2 UJ	2 U	2 U	2 U
1,2,4-TRIMETHYLBENZENE	UG/L	2 UJ	2 UJ	2 U	.3 J	2 U
1,2-DIBROMO-3-CHLOROPROPANE	UG/L	2 UJ	2 UJ	2 U	2 U	2 U
1,2-DIBROMOETHANE	UG/L	2 UJ	2 UJ	2 U	2 U	2 U
1,2-DICHLOROBENZENE	UG/L	.5 UJ	.5 UJ	.5 U	.5 J	12
1,2-DICHLOROETHANE	UG/L	.5 UJ	.5 UJ	.5 U	.1 J	35
1,2-DICHLOROETHYLENE	UG/L	.5 UJ	.4 J	.5 U	.8	63
1,2-DICHLOROPROPANE	UG/L	.5 UJ	.5 UJ	.5 U	.5 U	.06 J
1,3,5-TRIMETHYLBENZENE	UG/L	2 UJ	2 UJ	2 U	2 U	2 U
1,3-DICHLOROBENZENE	UG/L	.5 UJ	.5 UJ	.5 U	.5 U	.7
1,3-DICHLOROPROPANE	UG/L	.5 UJ	.5 UJ	.5 U	.5 U	.5 U
1,4-DICHLOROBENZENE	UG/L	.2 J	.1 J	.5 U	.5 U	.9
2-BUTANONE	UG/L	20 UJ	20 UJ	20 U	3 J	20 U
2-CHLOROTOLUENE	UG/L	2 UJ	2 UJ	2 U	2 U	2 U
2-HEXANONE	UG/L	20 UJ	20 UJ	20 U	20 U	20 U
4-CHLOROTOLUENE	UG/L	2 UJ	2 UJ	2 U	2 U	2 U
4-METHYL-2-PENTANONE	UG/L	20 UJ	20 UJ	20 U	20 U	20 U
ACETONE	UG/L	20 UJ	20 UJ		6 J	6 J
BENZENE	UG/L	.5 UJ	.5 UJ	.5 U	.1 J	1.7
BROMOBENZENE	UG/L	.5 UJ	.5 UJ	.5 U	.5 U	.5 U
BROMOCHLOROMETHANE	UG/L	.5 UJ	.5 UJ	.5 U	.5 U	.5 U
BROMODICHLOROMETHANE	UG/L	.2 J	.1 J	.5 U	.5 U	.5 U
BROMOFORM	UG/L	.5 UJ	.5 UJ	.5 U	.5 U	.5 U
BROMOMETHANE	UG/L	.5 UJ	.5 UJ	.5 U	.5 U	.5 U
CARBON DISULFIDE	UG/L	.5 UJ	.3 J	.5 U	.5 UJ	.5 UJ
CARBON TETRACHLORIDE	UG/L	.5 UJ	.5 UJ	.5 U	.5 U	.5 U
CHLOROBENZENE	UG/L	.5 UJ	.5 UJ	.5 U	.5 U	.9
CHLORODIBROMOMETHANE	UG/L	.1 J	.5 UJ	.5 U	.5 U	.5 U
CHLOROETHANE	UG/L	.5 UJ	.5 UJ	.5 U	.5 U	5
CHLOROFORM	UG/L	.5 UJ	.1 J	.5 U	.5 U	1.1
CHLOROMETHANE	UG/L	.5 UJ	.5 UJ	.2 J	.2 J	.2 J
CIS-1,3-DICHLOROPROPENE	UG/L	.5 UJ	.5 UJ	.5 U	.5 U	.5 U
DIBROMOMETHANE	UG/L	.5 UJ	.5 UJ	.5 U	.5 U	.5 U
DICHLORODIFLUOROMETHANE	UG/L	.5 UJ	.5 UJ	.5 U	.5 UJ	.5 UJ
ETHYLBENZENE	UG/L	.5 UJ	.5 UJ	.5 U	.1 J	16
HEXACHLOROBUTADIENE	UG/L	2 UJ	2 UJ	2 U	2 U	2 U
ISOPROPYLBENZENE	UG/L	2 UJ	2 UJ	2 U	2 U	3
METHYLENE CHLORIDE	UG/L	1 UJ	1 UJ	1 U	1 U	2
N-BUTYLBENZENE	UG/L	2 UJ	2 UJ	2 U	2 U	2 U
N-PROPYLBENZENE	UG/L	2 UJ	2 UJ	2 U	2 U	5
NAPHTHALENE	UG/L	2 UJ	2 UJ	2 UJ	2 U	2 U
P-ISOPROPYLTOLUENE	UG/L	2 UJ	2 UJ	2 U	2 U	.4 J
SEC-BUTYLBENZENE	UG/L	2 UJ	2 UJ	2 U	2 U	.5 J
SEC-DICHLOROPROPANE	UG/L	.5 UJ	.5 UJ	.5 U	.5 U	.5 U
STYRENE	UG/L	.5 UJ	.5 UJ	.5 U	.5 U	.5 U
TERT-BUTYLBENZENE	UG/L	2 UJ	2 UJ	2 U	2 U	2 U
TETRACHLOROETHENE	UG/L	.5 UJ	.5 UJ	.5 U	.5 U	.5 U
TOLUENE	UG/L	.5 UJ	.5 UJ	.2 J	.4 J	.5 J
TOTAL XYLENES	UG/L	.5 UJ	.5 UJ	.5 U	.6	1.4
TRANS-1,3-DICHLOROPROPENE	UG/L	.5 UJ	.5 UJ	.5 U	.5 U	.5 U
TRICHLOROETHENE	UG/L	.5 UJ	.5 UJ	.5 U	.5 U	.2 J
TRICHLOROFLUOROMETHANE	UG/L	.5 UJ	.5 UJ	.5 U	.5 U	.5 U
VINYL CHLORIDE	UG/L	.5 UJ	.5 UJ	.5 U	.5 U	8.5

ANALYTE_NAME	UNITS	PW-5 147P051 REG 2/9/98	PW-5 147P055 REG 2/9/98	PW-6 147P061 REG 2/12/98	PW-6 147P063 REG 2/12/98	PW-7 147P071 REG 2/12/98
1,1,1,2-TETRACHLOROETHANE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
1,1,1-TRICHLOROETHANE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
1,1,2,2-TETRACHLOROETHANE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
1,1,2-TRICHLOROETHANE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
1,1-DICHLOROETHANE	UG/L	.5 U	39	.5 U	.5 U	.5 U
1,1-DICHLOROETHENE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
1,1-DICHLOROPROPENE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
1,2,3-TRICHLOROBENZENE	UG/L	2 U	2 U	2 U	2 U	2 U
1,2,3-TRICHLOROPROPANE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
1,2,4-TRICHLOROBENZENE	UG/L	2 U	2 U	2 U	2 U	2 U
1,2,4-TRIMETHYLBENZENE	UG/L	2 U	2 U	2 U	2 U	2 U
1,2-DIBROMO-3-CHLOROPROPANE	UG/L	2 U	2 U	2 U	2 U	2 U
1,2-DIBROMOETHANE	UG/L	2 U	2 U	2 U	2 U	2 U
1,2-DICHLOROBENZENE	UG/L	.2 J	.6	.5 U	.5 U	.5 U
1,2-DICHLOROETHANE	UG/L	.5 J	.4 J	.5 U	.5 U	.5 U
1,2-DICHLOROETHYLENE	UG/L	.5 U	.8	.5 U	.5 U	.5 U
1,2-DICHLOROPROPANE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
1,3,5-TRIMETHYLBENZENE	UG/L	2 U	2 U	2 U	2 U	2 U
1,3-DICHLOROBENZENE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
1,3-DICHLOROPROPANE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
1,4-DICHLOROBENZENE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
2-BUTANONE	UG/L	20 U	20 U	20 U	20 U	20 U
2-CHLOROTOLUENE	UG/L	2 U	2 U	2 U	2 U	2 U
2-HEXANONE	UG/L	20 U	20 U	20 U	20 U	20 U
4-CHLOROTOLUENE	UG/L	2 U	2 U	2 U	2 U	2 U
4-METHYL-2-PENTANONE	UG/L	20 U	20 U	20 U	20 U	20 U
ACETONE	UG/L	5 J	6 J			
BENZENE	UG/L	.5 U	.07 J	.5 U	.5 U	.5 U
BROMOBENZENE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
BROMOCHLOROMETHANE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
BROMODICHLOROMETHANE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
BROMOFORM	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
BROMOMETHANE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
CARBON DISULFIDE	UG/L	.4 J	.5 UJ	.5 U	.5 U	.5 U
CARBON TETRACHLORIDE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
CHLOROBENZENE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
CHLORODIBROMOMETHANE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
CHLOROETHANE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
CHLOROFORM	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
CHLOROMETHANE	UG/L	.5 U	.1 J	.5 U	.5 U	.5 U
CIS-1,3-DICHLOROPROPENE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
DIBROMOMETHANE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
DICHLORODIFLUOROMETHANE	UG/L	.5 UJ	.5 UJ	.5 U	.5 U	.5 UJ
ETHYLBENZENE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
HEXACHLOROBUTADIENE	UG/L	2 U	2 U	2 U	2 U	2 U
ISOPROPYLBENZENE	UG/L	2 U	2 U	2 U	2 U	2 U
METHYLENE CHLORIDE	UG/L	1 U	1 U	.2 J	1 U	.3 J
N-BUTYLBENZENE	UG/L	2 U	2 U	2 U	2 U	2 U
N-PROPYLBENZENE	UG/L	2 U	2 U	2 U	2 U	2 U
NAPHTHALENE	UG/L	2 U	2 U	2 U	2 U	2 U
P-ISOPROPYLTOLUENE	UG/L	2 U	2 U	2 U	2 U	2 U
SEC-BUTYLBENZENE	UG/L	2 U	2 U	2 U	2 U	2 U
SEC-DICHLOROPROPANE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
STYRENE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
TERT-BUTYLBENZENE	UG/L	2 U	2 U	2 U	2 U	2 U
TETRACHLOROETHENE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
TOLUENE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
TOTAL XYLENES	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
TRANS-1,3-DICHLOROPROPENE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
TRICHLOROETHENE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
TRICHLOROFLUOROMETHANE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
VINYL CHLORIDE	UG/L	.5 U	.7	.5 U	.5 U	.5 U

ANALYTE_NAME	UNITS	PW-7 147P075 REG 2/12/98	PW-8 147P081 REG 2/13/98	PW-8 147P085 REG 2/13/98	PW-9 147P091 REG 2/13/98	PW-9 147P095 REG 2/13/98
1,1,1,2-TETRACHLOROETHANE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
1,1,1-TRICHLOROETHANE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
1,1,2,2-TETRACHLOROETHANE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
1,1,2-TRICHLOROETHANE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
1,1-DICHLOROETHANE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
1,1-DICHLOROETHENE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
1,1-DICHLOROPROPENE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
1,2,3-TRICHLOROBENZENE	UG/L	2 U	2 UJ	2 UJ	2 UJ	2 UJ
1,2,3-TRICHLOROPROPANE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
1,2,4-TRICHLOROBENZENE	UG/L	2 U	2 UJ	2 UJ	2 UJ	2 UJ
1,2,4-TRIMETHYLBENZENE	UG/L	2 U	2 U	.7 J	2 U	2 U
1,2-DIBROMO-3-CHLOROPROPANE	UG/L	2 U	2 U	2 U	2 U	2 U
1,2-DIBROMOETHANE	UG/L	2 U	2 U	2 U	2 U	2 U
1,2-DICHLOROBENZENE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
1,2-DICHLOROETHANE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
1,2-DICHLOROETHYLENE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
1,2-DICHLOROPROPANE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
1,3,5-TRIMETHYLBENZENE	UG/L	2 U	2 U	.4 J	2 U	2 U
1,3-DICHLOROBENZENE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
1,3-DICHLOROPROPANE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
1,4-DICHLOROBENZENE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
2-BUTANONE	UG/L	20 U	20 U	20 U	20 U	20 U
2-CHLOROTOLUENE	UG/L	2 U	2 U	2 U	2 U	2 U
2-HEXANONE	UG/L	20 U	20 U	20 U	20 U	20 U
4-CHLOROTOLUENE	UG/L	2 U	2 U	2 U	2 U	2 U
4-METHYL-2-PENTANONE	UG/L	20 U	20 U	20 U	20 U	20 U
ACETONE	UG/L					
BENZENE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
BROMOBENZENE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
BROMOCHLOROMETHANE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
BROMODICHLOROMETHANE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
BROMOFORM	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
BROMOMETHANE	UG/L	.5 U	.5 UJ	.5 UJ	.5 UJ	.5 UJ
CARBON DISULFIDE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
CARBON TETRACHLORIDE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
CHLOROBENZENE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
CHLORODIBROMOMETHANE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
CHLOROETHANE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
CHLOROFORM	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
CHLOROMETHANE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
CIS-1,3-DICHLOROPROPENE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
DIBROMOMETHANE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
DICHLORODIFLUOROMETHANE	UG/L	.5 UJ	.5 UJ	.5 UJ	.5 UJ	.5 UJ
ETHYLBENZENE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
HEXACHLOROBUTADIENE	UG/L	2 U	2 U	2 U	2 U	2 U
ISOPROPYLBENZENE	UG/L	2 U	2 U	2 U	2 U	2 U
METHYLENE CHLORIDE	UG/L	1 U	1 U	.1 J	.1 J	1 U
N-BUTYLBENZENE	UG/L	2 U	2 UJ	2 UJ	2 UJ	2 UJ
N-PROPYLBENZENE	UG/L	2 U	2 U	.3 J	2 U	2 U
NAPHTHALENE	UG/L	2 U	2 UJ	2 UJ	2 UJ	2 UJ
P-ISOPROPYLTOLUENE	UG/L	2 U	2 U	2 U	2 U	2 U
SEC-BUTYLBENZENE	UG/L	2 U	2 U	2 U	2 U	2 U
SEC-DICHLOROPROPANE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
STYRENE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
TERT-BUTYLBENZENE	UG/L	2 U	2 U	2 U	2 U	2 U
TETRACHLOROETHENE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
TOLUENE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
TOTAL XYLENES	UG/L	.5 U	.5 U	.5 J	.2 J	.5 U
TRANS-1,3-DICHLOROPROPENE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
TRICHLOROETHENE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
TRICHLOROFLUOROMETHANE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
VINYL CHLORIDE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U

ANALYTE_NAME	UNITS	PW-10 147P101 REG 2/13/98	PW-10 147P105 REG 2/13/98	PW-11 147P111 REG 2/9/98	PW-11 147P115 REG 2/9/98	PW-12 147B121 REG 4/25/98
1,1,1,2-TETRACHLOROETHANE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 UJ
1,1,1-TRICHLOROETHANE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 UJ
1,1,2,2-TETRACHLOROETHANE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 UJ
1,1,2-TRICHLOROETHANE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 UJ
1,1-DICHLOROETHANE	UG/L	.5 U	.5 U	.5 U	39	.5 UJ
1,1-DICHLOROETHENE	UG/L	.5 U	.5 U	.5 U	.3 J	.5 UJ
1,1-DICHLOROPROPENE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 UJ
1,2,3-TRICHLOROBENZENE	UG/L	2 UJ	2 UJ	2 U	2 U	2 UJ
1,2,3-TRICHLOROPROPANE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 UJ
1,2,4-TRICHLOROBENZENE	UG/L	2 UJ	2 UJ	2 U	2 U	2 UJ
1,2,4-TRIMETHYLBENZENE	UG/L	2 U	3	2 U	.2 J	2 UJ
1,2-DIBROMO-3-CHLOROPROPANE	UG/L	2 U	2 U	2 U	2 U	2 UJ
1,2-DIBROMOETHANE	UG/L	2 U	2 U	2 U	2 U	2 UJ
1,2-DICHLOROBENZENE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 UJ
1,2-DICHLOROETHANE	UG/L	.5 U	.5 U	.05 J	.6	.5 UJ
1,2-DICHLOROETHYLENE	UG/L	.5 U	.3 J	.5 U	1.4	.5 J
1,2-DICHLOROPROPANE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 UJ
1,3,5-TRIMETHYLBENZENE	UG/L	2 U	2 J	2 U	2 U	2 UJ
1,3-DICHLOROBENZENE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 UJ
1,3-DICHLOROPROPANE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 UJ
1,4-DICHLOROBENZENE	UG/L	.5 U	.5 U	.5 U	.5 U	.1 J
2-BUTANONE	UG/L	20 U	20 U	20 U	3 J	20 UJ
2-CHLOROTOLUENE	UG/L	2 U	2 U	2 U	2 U	2 UJ
2-HEXANONE	UG/L	20 U	20 U	20 U	20 U	20 U
4-CHLOROTOLUENE	UG/L	2 U	2 U	2 U	2 U	2 UJ
4-METHYL-2-PENTANONE	UG/L	20 U	20 U	20 U	20 U	2 J
ACETONE	UG/L			5 J	5 J	
BENZENE	UG/L	.5 U	.5 U	.5 U	.08 J	.5 UJ
BROMOBENZENE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 UJ
BROMOCHLOROMETHANE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 UJ
BROMODICHLOROMETHANE	UG/L	.5 U	.5 U	.5 U	.5 U	.1 J
BROMOFORM	UG/L	.5 U	.5 U	.5 U	.5 U	.5 UJ
BROMOMETHANE	UG/L	.5 UJ	.5 UJ	.5 UJ	.5 U	.5 UJ
CARBON DISULFIDE	UG/L	.5 U	.5 U	.4 J	.2 J	.5 UJ
CARBON TETRACHLORIDE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 UJ
CHLOROBENZENE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 UJ
CHLORODIBROMOMETHANE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 UJ
CHLOROETHANE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 UJ
CHLOROFORM	UG/L	.5 U	.5 U	.5 U	.5 U	.2 J
CHLOROMETHANE	UG/L	.5 U	.5 U	.5 U	.2 J	.5 UJ
CIS-1,3-DICHLOROPROPENE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
DIBROMOMETHANE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 UJ
DICHLORODIFLUOROMETHANE	UG/L	.5 UJ	.5 UJ	.5 U	.5 UJ	.5 UJ
ETHYLBENZENE	UG/L	.5 U	.5 J	.5 U	.08 J	.5 UJ
HEXACHLOROBUTADIENE	UG/L	2 U	2 U	2 U	2 U	2 UJ
ISOPROPYLBENZENE	UG/L	2 U	.2 J	2 U	2 U	2 UJ
METHYLENE CHLORIDE	UG/L	.1 J	.8 J	1 U	1 U	1 UJ
N-BUTYLBENZENE	UG/L	2 UJ	2 UJ	2 U	2 U	2 UJ
N-PROPYLBENZENE	UG/L	2 U	1 J	2 U	2 U	2 UJ
NAPHTHALENE	UG/L	2 UJ	.7 J	2 U	2 U	2 UJ
P-ISOPROPYLTOLUENE	UG/L	2 U	2 U	2 U	2 U	2 UJ
SEC-BUTYLBENZENE	UG/L	2 U	.3 J	2 U	2 U	2 UJ
SEC-DICHLOROPROPANE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 UJ
STYRENE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 UJ
TERT-BUTYLBENZENE	UG/L	2 U	2 U	2 U	2 U	2 UJ
TETRACHLOROETHENE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 UJ
TOLUENE	UG/L	.5 U	.5 U	.5 U	.5 U	.2 J
TOTAL XYLENES	UG/L	.5 U	2.5	.5 U	.4 J	.5 UJ
TRANS-1,3-DICHLOROPROPENE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 UJ
TRICHLOROETHENE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 UJ
TRICHLOROFLUOROMETHANE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 UJ
VINYL CHLORIDE	UG/L	.5 U	.5 U	.5 U	.4 J	.5 UJ

ANALYTE_NAME	UNITS	PW-12 147B125 REG 4/25/98	PW-12 147BW12 AB 4/24/98	PW-12 147P121 REG 2/9/98	PW-12 147P124 REG 2/9/98	PW-13 147B131 REG 4/27/98
1,1,1,2-TETRACHLOROETHANE	UG/L	.5 UJ	.5 U	.5 U	.5 U	.5 UJ
1,1,1-TRICHLOROETHANE	UG/L	.5 UJ	.5 U	.5 U	.5 U	.5 UJ
1,1,2,2-TETRACHLOROETHANE	UG/L	.5 UJ	.5 U	.5 U	.5 U	.5 UJ
1,1,2-TRICHLOROETHANE	UG/L	.5 UJ	.5 U	.5 U	.5 U	.5 UJ
1,1-DICHLOROETHANE	UG/L	.2 J	.5 U	11	16	.5 UJ
1,1-DICHLOROETHENE	UG/L	.5 UJ	.9	.5 U	.5 J	1.8 J
1,1-DICHLOROPROPENE	UG/L	.5 UJ	.5 U	.5 U	.5 U	.5 UJ
1,2,3-TRICHLOROBENZENE	UG/L	2 UJ	2 U	2 U	2 U	2 UJ
1,2,3-TRICHLOROPROPANE	UG/L	.5 UJ	.5 U	.5 U	.5 U	.5 UJ
1,2,4-TRICHLOROBENZENE	UG/L	2 UJ	2 UJ	2 U	2 U	2 UJ
1,2,4-TRIMETHYLBENZENE	UG/L	2 UJ	2 U	2 U	2 U	2 UJ
1,2-DIBROMO-3-CHLOROPROPANE	UG/L	2 UJ	2 U	2 U	2 U	2 UJ
1,2-DIBROMOETHANE	UG/L	2 UJ	2 U	2 U	2 U	2 UJ
1,2-DICHLOROBENZENE	UG/L	.5 UJ	.5 U	6	3.6	.5 UJ
1,2-DICHLOROETHANE	UG/L	.5 UJ	.5 U	.1 J	.1 J	.5 UJ
1,2-DICHLOROETHYLENE	UG/L	.2 J	3.1	.8	2.5	3.1 J
1,2-DICHLOROPROPANE	UG/L	.5 UJ	.5 U	.5 U	.5 U	.5 UJ
1,3,5-TRIMETHYLBENZENE	UG/L	2 UJ	2 U	2 U	2 U	2 UJ
1,3-DICHLOROBENZENE	UG/L	.5 UJ	.5 U	.2 J	.2 J	.5 UJ
1,3-DICHLOROPROPANE	UG/L	.5 UJ	.5 U	.5 U	.5 U	.5 UJ
1,4-DICHLOROBENZENE	UG/L	.1 J	.5 U	.2 J	.3 J	.07 J
2-BUTANONE	UG/L	20 UJ	20 U	20 U	20 U	20 UJ
2-CHLOROTOLUENE	UG/L	2 UJ	2 U	2 U	2 U	2 UJ
2-HEXANONE	UG/L	20 UJ	20 U	20 U	20 U	20 UJ
4-CHLOROTOLUENE	UG/L	2 UJ	2 U	2 U	2 U	2 UJ
4-METHYL-2-PENTANONE	UG/L	20 UJ	20 U	20 U	20 U	20 UJ
ACETONE	UG/L		20 UJ	6 J	4 J	6 J
BENZENE	UG/L	.5 UJ	.5 U	.5 U	.08 J	.5 UJ
BROMOBENZENE	UG/L	.5 UJ	.5 U	.5 U	.5 U	.5 UJ
BROMOCHLOROMETHANE	UG/L	.5 UJ	.5 U	.5 U	.5 U	.5 UJ
BROMODICHLOROMETHANE	UG/L	.5 UJ	.5 U	.5 U	.5 U	.1 J
BROMOFORM	UG/L	.5 UJ	.5 U	.5 U	.5 U	.5 UJ
BROMOMETHANE	UG/L	.5 UJ	.5 U	.5 U	.5 U	.5 UJ
CARBON DISULFIDE	UG/L	.5 UJ	.5 U	.5 UJ	.5 UJ	.5 UJ
CARBON TETRACHLORIDE	UG/L	.5 UJ	.5 U	.5 U	.5 U	.5 UJ
CHLOROBENZENE	UG/L	.5 UJ	.5 U	.2 J	.4 J	.5 UJ
CHLORODIBROMOMETHANE	UG/L	.5 UJ	.5 U	.5 U	.5 U	.5 UJ
CHLOROETHANE	UG/L	.5 UJ	.5 U	.5 U	.5 U	.5 UJ
CHLOROFORM	UG/L	.08 J	.5 U	.5 U	.5 U	.1 J
CHLOROMETHANE	UG/L	.5 UJ	.5 U	.1 J	.5 U	.5 UJ
CIS-1,3-DICHLOROPROPENE	UG/L	.5 UJ	.5 U	.5 U	.5 U	.5 UJ
DIBROMOMETHANE	UG/L	.5 UJ	.5 U	.5 U	.5 U	.5 UJ
DICHLORODIFLUOROMETHANE	UG/L	.5 UJ	.5 UJ	.5 U	.5 U	.5 UJ
ETHYLBENZENE	UG/L	.5 UJ	.5 U	.5 U	.5 U	.5 UJ
HEXACHLOROBUTADIENE	UG/L	2 UJ	2 U	2 U	2 U	2 UJ
ISOPROPYLBENZENE	UG/L	2 UJ	2 U	2 U	2 U	2 UJ
METHYLENE CHLORIDE	UG/L	.1 J	1 U	1 U	1 U	1 UJ
N-BUTYLBENZENE	UG/L	2 UJ	2 U	2 U	2 U	2 UJ
N-PROPYLBENZENE	UG/L	2 UJ	2 U	2 U	2 U	2 UJ
NAPHTHALENE	UG/L	2 UJ	2 UJ	2 U	2 U	2 UJ
P-ISOPROPYLTOLUENE	UG/L	2 UJ	2 U	2 U	2 U	2 UJ
SEC-BUTYLBENZENE	UG/L	2 UJ	2 U	2 U	2 U	2 UJ
SEC-DICHLOROPROPANE	UG/L	.5 UJ	.5 U	.5 U	.5 U	.5 UJ
STYRENE	UG/L	.5 UJ	.5 U	.5 U	.5 U	.5 UJ
TERT-BUTYLBENZENE	UG/L	2 UJ	2 U	2 U	2 U	2 UJ
TETRACHLOROETHENE	UG/L	.5 UJ	.5 U	.5 U	.5 U	.5 UJ
TOLUENE	UG/L	.1 J	.1 J	.07 J	.08 J	.05 J
TOTAL XYLENES	UG/L	.5 UJ	.5 U	.5 U	.5 U	.5 UJ
TRANS-1,3-DICHLOROPROPENE	UG/L	.5 UJ	.5 U	.5 U	.5 U	.5 UJ
TRICHLOROETHENE	UG/L	.5 UJ	.5 U	.5 U	.06 J	.5 UJ
TRICHLOROFLUOROMETHANE	UG/L	.5 UJ	.5 U	.5 U	.5 U	.5 UJ
VINYL CHLORIDE	UG/L	.5 UJ	.7	.7	1.4	.6 J

ANALYTE_NAME	UNITS	PW-13 147B132 REG 4/27/98	PW-13 147B133 REG 4/27/98	PW-13 147B134 REG 4/27/98	PW-13 147B135 REG 4/27/98	PW-13 147B136 REG 4/27/98
1,1,1,2-TETRACHLOROETHANE	UG/L	.5 UJ	.5 UJ	.5 UJ	.5 UJ	.5 UJ
1,1,1-TRICHLOROETHANE	UG/L	.5 UJ	.5 UJ	.5 UJ	.5 UJ	.5 UJ
1,1,2,2-TETRACHLOROETHANE	UG/L	.5 UJ	.5 UJ	.5 UJ	.5 UJ	.5 UJ
1,1,2-TRICHLOROETHANE	UG/L	.5 UJ	.5 UJ	.5 UJ	.5 UJ	.5 UJ
1,1-DICHLOROETHANE	UG/L	.5 UJ	.4 J	.4 J	.6 J	.7 J
1,1-DICHLOROETHENE	UG/L	5.1 J	5.4 J	3.5 J	3.4 J	2.8 J
1,1-DICHLOROPROPENE	UG/L	.5 UJ	.5 UJ	.5 UJ	.5 UJ	.5 UJ
1,2,3-TRICHLOROBENZENE	UG/L	2 UJ	2 UJ	2 UJ	2 UJ	2 UJ
1,2,3-TRICHLOROPROPANE	UG/L	.5 UJ	.5 UJ	.5 UJ	.5 UJ	.5 UJ
1,2,4-TRICHLOROBENZENE	UG/L	2 UJ	2 UJ	2 UJ	2 UJ	2 UJ
1,2,4-TRIMETHYLBENZENE	UG/L	2 UJ	2 UJ	2 UJ	2 UJ	2 UJ
1,2-DIBROMO-3-CHLOROPROPANE	UG/L	2 UJ	2 UJ	2 UJ	2 UJ	2 UJ
1,2-DIBROMOETHANE	UG/L	2 UJ	2 UJ	2 UJ	2 UJ	2 UJ
1,2-DICHLOROBENZENE	UG/L	.5 UJ	.5 UJ	.5 UJ	.5 UJ	.5 UJ
1,2-DICHLOROETHANE	UG/L	.5 UJ	.5 UJ	.5 UJ	.5 UJ	.5 UJ
1,2-DICHLOROETHYLENE	UG/L	7.9 J	8.7 J	5.2 J	5.1 J	4.1 J
1,2-DICHLOROPROPANE	UG/L	.5 UJ	.5 UJ	.5 UJ	.5 UJ	.5 UJ
1,3,5-TRIMETHYLBENZENE	UG/L	2 UJ	2 UJ	2 UJ	2 UJ	2 UJ
1,3-DICHLOROBENZENE	UG/L	.5 UJ	.5 UJ	.5 UJ	.5 UJ	.5 UJ
1,3-DICHLOROPROPANE	UG/L	.5 UJ	.5 UJ	.5 UJ	.5 UJ	.5 UJ
1,4-DICHLOROBENZENE	UG/L	.09 J	.05 J	.08 J	.5 UJ	.1 J
2-BUTANONE	UG/L	20 UJ	20 UJ	20 UJ	20 UJ	20 UJ
2-CHLOROTOLUENE	UG/L	2 UJ	2 UJ	2 UJ	2 UJ	2 UJ
2-HEXANONE	UG/L	20 UJ	20 UJ	20 UJ	20 UJ	20 UJ
4-CHLOROTOLUENE	UG/L	2 UJ	2 UJ	2 UJ	2 UJ	2 UJ
4-METHYL-2-PENTANONE	UG/L	20 UJ	20 UJ	20 UJ	20 UJ	20 UJ
ACETONE	UG/L					
BENZENE	UG/L	.5 UJ	.5 UJ	.5 UJ	.5 UJ	.5 UJ
BROMOBENZENE	UG/L	.5 UJ	.5 UJ	.5 UJ	.5 UJ	.5 UJ
BROMOCHLOROMETHANE	UG/L	.5 UJ	.5 UJ	.5 UJ	.5 UJ	.5 UJ
BROMODICHLOROMETHANE	UG/L	.5 UJ	.5 UJ	.5 UJ	.5 UJ	.5 UJ
BROMOFORM	UG/L	.5 UJ	.5 UJ	.5 UJ	.5 UJ	.5 UJ
BROMOMETHANE	UG/L	.5 UJ	.5 UJ	.5 UJ	.5 UJ	.5 UJ
CARBON DISULFIDE	UG/L	.5 UJ	.5 UJ	.5 UJ	.5 UJ	.5 UJ
CARBON TETRACHLORIDE	UG/L	.5 UJ	.5 UJ	.5 UJ	.5 UJ	.5 UJ
CHLOROBENZENE	UG/L	.5 UJ	.5 UJ	.5 UJ	.5 UJ	.5 UJ
CHLORODIBROMOMETHANE	UG/L	.5 UJ	.5 UJ	.5 UJ	.5 UJ	.5 UJ
CHLOROETHANE	UG/L	.5 UJ	.5 UJ	.5 UJ	.5 UJ	.5 UJ
CHLOROFORM	UG/L	.06 J	.5 UJ	.05 J	.5 UJ	.06 J
CHLOROMETHANE	UG/L	.5 UJ	.5 UJ	.5 UJ	.5 UJ	.5 UJ
CIS-1,3-DICHLOROPROPENE	UG/L	.5 UJ	.5 UJ	.5 UJ	.5 UJ	.5 UJ
DIBROMOMETHANE	UG/L	.5 UJ	.5 UJ	.5 UJ	.5 UJ	.5 UJ
DICHLORODIFLUOROMETHANE	UG/L	.5 UJ	.5 UJ	.5 UJ	.5 UJ	.5 UJ
ETHYLBENZENE	UG/L	.5 UJ	.5 UJ	.5 UJ	.5 UJ	.5 UJ
HEXACHLOROBUTADIENE	UG/L	2 UJ	2 UJ	2 UJ	2 UJ	2 UJ
ISOPROPYLBENZENE	UG/L	2 UJ	2 UJ	2 UJ	2 UJ	2 UJ
METHYLENE CHLORIDE	UG/L	1 UJ	1 UJ	1 UJ	1 UJ	1 UJ
N-BUTYLBENZENE	UG/L	2 UJ	2 UJ	2 UJ	.07 J	2 UJ
N-PROPYLBENZENE	UG/L	2 UJ	2 UJ	2 UJ	2 UJ	2 UJ
NAPHTHALENE	UG/L	2 UJ	2 UJ	2 UJ	2 UJ	2 UJ
P-ISOPROPYLTOLUENE	UG/L	2 UJ	2 UJ	2 UJ	2 UJ	2 UJ
SEC-BUTYLBENZENE	UG/L	2 UJ	2 UJ	2 UJ	2 UJ	2 UJ
SEC-DICHLOROPROPANE	UG/L	.5 UJ	.5 UJ	.5 UJ	.5 UJ	.5 UJ
STYRENE	UG/L	.5 UJ	.5 UJ	.5 UJ	.5 UJ	.5 UJ
TERT-BUTYLBENZENE	UG/L	2 UJ	2 UJ	2 UJ	2 UJ	2 UJ
TETRACHLOROETHENE	UG/L	.5 UJ	.5 UJ	.5 UJ	.5 UJ	.5 UJ
TOLUENE	UG/L	.5 UJ	.5 UJ	.5 UJ	.5 UJ	.5 UJ
TOTAL XYLENES	UG/L	.5 UJ	.5 UJ	.5 UJ	.5 UJ	.5 UJ
TRANS-1,3-DICHLOROPROPENE	UG/L	.5 UJ	.5 UJ	.5 UJ	.5 UJ	.5 UJ
TRICHLOROETHENE	UG/L	.5 UJ	.5 UJ	.5 UJ	.5 UJ	.5 UJ
TRICHLOROFLUOROMETHANE	UG/L	.5 UJ	.5 UJ	.5 UJ	.5 UJ	.5 UJ
VINYL CHLORIDE	UG/L	1.4 J	1.4 J	1 J	1 J	1 J

ANALYTE_NAME	UNITS	PW-13 147BW13 AB 4/26/98	PW-13 147P131 REG 2/10/98	PW-13 147P135 REG 2/10/98	PW-14 147B145 REG 4/26/98	PW-14 147B146 REG 4/26/98
1,1,1,2-TETRACHLOROETHANE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 UJ
1,1,1-TRICHLOROETHANE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 UJ
1,1,2,2-TETRACHLOROETHANE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 UJ
1,1,2-TRICHLOROETHANE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 UJ
1,1-DICHLOROETHANE	UG/L	.5 U	.5 U	12	.5 U	.5 UJ
1,1-DICHLOROETHENE	UG/L	.5 U	.5 U	.5 U	.5 UJ	.5 UJ
1,1-DICHLOROPROPENE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 UJ
1,2,3-TRICHLOROBENZENE	UG/L	2 UJ	2 U	2 U	2 UJ	2 UJ
1,2,3-TRICHLOROPROPANE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 UJ
1,2,4-TRICHLOROBENZENE	UG/L	2 U	2 U	2 U	2 UJ	2 UJ
1,2,4-TRIMETHYLBENZENE	UG/L	2 U	2 U	2 U	2 U	2 UJ
1,2-DIBROMO-3-CHLOROPROPANE	UG/L	2 U	2 U	2 U	2 UJ	2 UJ
1,2-DIBROMOETHANE	UG/L	2 U	2 U	2 U	2 U	2 UJ
1,2-DICHLOROBENZENE	UG/L	.5 U	.5 U	.5 U	.5 UJ	.5 UJ
1,2-DICHLOROETHANE	UG/L	.5 U	.5 U	.3 J	.5 U	.5 UJ
1,2-DICHLOROETHYLENE	UG/L	.5 U	.5 U	.5 U	.5 U	1 UJ
1,2-DICHLOROPROPANE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 UJ
1,3,5-TRIMETHYLBENZENE	UG/L	2 U	2 U	2 U	2 U	2 UJ
1,3-DICHLOROBENZENE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 UJ
1,3-DICHLOROPROPANE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 UJ
1,4-DICHLOROBENZENE	UG/L	.5 U	.5 U	.5 U	.1 J	.05 J
2-BUTANONE	UG/L	20 U	20 U	20 U	20 U	20 UJ
2-CHLOROTOLUENE	UG/L	2 U	2 U	2 U	2 U	2 UJ
2-HEXANONE	UG/L	20 U	20 U	20 U	20 U	20 UJ
4-CHLOROTOLUENE	UG/L	2 U	2 U	2 U	2 U	2 UJ
4-METHYL-2-PENTANONE	UG/L	20 U	20 U	20 U	20 U	20 UJ
ACETONE	UG/L		10 J	20 U		
BENZENE	UG/L	.5 U	.5 U	.07 J	.5 U	.5 UJ
BROMOBENZENE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 UJ
BROMOCHLOROMETHANE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 UJ
BROMODICHLOROMETHANE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 UJ
BROMOFORM	UG/L	.5 U	.5 U	.5 U	.5 U	.5 UJ
BROMOMETHANE	UG/L	.5 U	.5 UJ	.5 UJ	.5 UJ	.5 UJ
CARBON DISULFIDE	UG/L	.5 U	.4 J	.5 UJ	.5 U	.5 UJ
CARBON TETRACHLORIDE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 UJ
CHLOROBENZENE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 UJ
CHLORODIBROMOMETHANE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 UJ
CHLOROETHANE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 UJ
CHLOROFORM	UG/L	.5 U	.5 U	.5 U	.09 J	.5 UJ
CHLOROMETHANE	UG/L	.2 J	.1 J	.5 U	.5 U	.5 UJ
CIS-1,3-DICHLOROPROPENE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 UJ
DIBROMOMETHANE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 UJ
DICHLORODIFLUOROMETHANE	UG/L	.5 U	.5 U	.5 U	.5 UJ	.5 UJ
ETHYLBENZENE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 UJ
HEXACHLOROBUTADIENE	UG/L	2 U	2 U	2 U	2 UJ	2 UJ
ISOPROPYLBENZENE	UG/L	2 U	2 U	2 U	2 U	2 UJ
METHYLENE CHLORIDE	UG/L	1 U	1 U	1 U	1 U	1 UJ
N-BUTYLBENZENE	UG/L	2 U	2 U	2 U	2 UJ	2 UJ
N-PROPYLBENZENE	UG/L	2 U	2 U	2 U	2 U	2 UJ
NAPHTHALENE	UG/L	2 UJ	2 U	.8 J	2 UJ	2 UJ
P-ISOPROPYLTOLUENE	UG/L	2 U	2 U	2 U	2 U	2 UJ
SEC-BUTYLBENZENE	UG/L	2 U	2 U	2 U	2 U	2 UJ
SEC-DICHLOROPROPANE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 UJ
STYRENE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 UJ
TERT-BUTYLBENZENE	UG/L	2 U	2 U	2 U	2 U	2 UJ
TETRACHLOROETHENE	UG/L	.5 U	.5 U	.5 U	.5 UJ	.5 UJ
TOLUENE	UG/L	.2 J	.05 J	.5 U	.5 U	.07 J
TOTAL XYLENES	UG/L	.5 U	.5 U	.5 U	.5 U	.5 UJ
TRANS-1,3-DICHLOROPROPENE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 UJ
TRICHLOROETHENE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 UJ
TRICHLOROFLUOROMETHANE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 UJ
VINYL CHLORIDE	UG/L	.5 U	.5 U	1.5	.2 J	.4 J

ANALYTE_NAME	UNITS	PW-14 147BW14 AB 4/25/98	PW-14 147P141 REG 2/10/98	PW-14 147P145 REG 2/10/98	PW-15 147P151 REG 2/10/98	PW-15 147P153 REG 2/10/98
1,1,1,2-TETRACHLOROETHANE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
1,1,1-TRICHLOROETHANE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
1,1,2,2-TETRACHLOROETHANE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
1,1,2-TRICHLOROETHANE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
1,1-DICHLOROETHANE	UG/L	.5 U	.5 U	.1 J	.5 U	.5 U
1,1-DICHLOROETHENE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
1,1-DICHLOROPROPENE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
1,2,3-TRICHLOROBENZENE	UG/L	2 U	2 U	2 U	2 U	2 U
1,2,3-TRICHLOROPROPANE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
1,2,4-TRICHLOROBENZENE	UG/L	2 UJ	2 U	2 U	2 U	2 U
1,2,4-TRIMETHYLBENZENE	UG/L	2 U	2 U	2 U	2 U	2 U
1,2-DIBROMO-3-CHLOROPROPANE	UG/L	2 U	2 U	2 U	2 U	2 U
1,2-DIBROMOETHANE	UG/L	2 U	2 U	2 U	2 U	2 U
1,2-DICHLOROBENZENE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
1,2-DICHLOROETHANE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
1,2-DICHLOROETHYLENE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
1,2-DICHLOROPROPANE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
1,3,5-TRIMETHYLBENZENE	UG/L	2 U	2 U	2 U	2 U	2 U
1,3-DICHLOROBENZENE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
1,3-DICHLOROPROPANE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
1,4-DICHLOROBENZENE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
2-BUTANONE	UG/L	20 U	20 U	20 U	8 J	20 U
2-CHLOROTOLUENE	UG/L	2 U	2 U	2 U	2 U	2 U
2-HEXANONE	UG/L	20 U	20 U	20 U	20 U	20 U
4-CHLOROTOLUENE	UG/L	2 U	2 U	2 U	2 U	2 U
4-METHYL-2-PENTANONE	UG/L	20 U	20 U	20 U	20 U	20 U
ACETONE	UG/L		20 U	20 U	5 J	20 U
BENZENE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
BROMOBENZENE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
BROMOCHLOROMETHANE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
BROMODICHLOROMETHANE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
BROMOFORM	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
BROMOMETHANE	UG/L	.5 U	.5 UJ	.5 UJ	.5 U	.5 U
CARBON DISULFIDE	UG/L	.5 U	.5 UJ	.2 J	.5 UJ	.5 UJ
CARBON TETRACHLORIDE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
CHLOROBENZENE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
CHLORODIBROMOMETHANE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
CHLOROETHANE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
CHLOROFORM	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
CHLOROMETHANE	UG/L	.5 U	.5 U	.5 U	1.1	.5 U
CIS-1,3-DICHLOROPROPENE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
DIBROMOMETHANE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
DICHLORODIFLUOROMETHANE	UG/L	.5 UJ	.5 U	.5 U	.5 U	.5 U
ETHYLBENZENE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
HEXACHLOROBUTADIENE	UG/L	2 U	2 U	2 U	2 U	2 U
ISOPROPYLBENZENE	UG/L	2 U	2 U	2 U	2 U	2 U
METHYLENE CHLORIDE	UG/L	1 U	1 U	.1 J	1 U	1 U
N-BUTYLBENZENE	UG/L	2 U	2 U	2 U	2 U	2 U
N-PROPYLBENZENE	UG/L	2 U	2 U	2 U	2 U	2 U
NAPHTHALENE	UG/L	2 UJ	2 U	2 U	2 U	2 U
P-ISOPROPYLTOLUENE	UG/L	2 U	2 U	2 U	2 U	2 U
SEC-BUTYLBENZENE	UG/L	2 U	2 U	2 U	2 U	2 U
SEC-DICHLOROPROPANE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 UJ
STYRENE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
TERT-BUTYLBENZENE	UG/L	2 U	2 U	2 U	2 U	2 U
TETRACHLOROETHENE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
TOLUENE	UG/L	.1 J	.5 U	.5 U	.08 J	.5 U
TOTAL XYLENES	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
TRANS-1,3-DICHLOROPROPENE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
TRICHLOROETHENE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
TRICHLOROFLUOROMETHANE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
VINYL CHLORIDE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U

ANALYTE_NAME	UNITS	PW-16 147P161 REG 2/12/98	PW-16 147P165 REG 2/12/98	PW-17 147P171 REG 2/12/98	PW-17 147P175 REG 2/12/98	PW-18 147P181 REG 2/12/98
1,1,1,2-TETRACHLOROETHANE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
1,1,1-TRICHLOROETHANE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
1,1,2,2-TETRACHLOROETHANE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
1,1,2-TRICHLOROETHANE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
1,1-DICHLOROETHANE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
1,1-DICHLOROETHENE	UG/L	.5 U	.5 U	.4 J	.5 U	.5 U
1,1-DICHLOROPROPENE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
1,2,3-TRICHLOROBENZENE	UG/L	2 U	2 U	2 U	2 U	2 U
1,2,3-TRICHLOROPROPANE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
1,2,4-TRICHLOROBENZENE	UG/L	2 U	2 U	2 U	2 U	2 U
1,2,4-TRIMETHYLBENZENE	UG/L	2 U	2 U	2 U	2 U	2 U
1,2-DIBROMO-3-CHLOROPROPANE	UG/L	2 U	2 U	2 U	2 U	2 U
1,2-DIBROMOETHANE	UG/L	2 U	2 U	2 U	2 U	2 U
1,2-DICHLOROBENZENE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
1,2-DICHLOROETHANE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
1,2-DICHLOROETHYLENE	UG/L	.5 U	.5 U	1	.5 U	.5 U
1,2-DICHLOROPROPANE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
1,3,5-TRIMETHYLBENZENE	UG/L	2 U	2 U	2 U	2 U	2 U
1,3-DICHLOROBENZENE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
1,3-DICHLOROPROPANE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
1,4-DICHLOROBENZENE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
2-BUTANONE	UG/L	20 U	20 U	20 U	20 U	20 U
2-CHLOROTOLUENE	UG/L	2 U	2 U	2 U	2 U	2 U
2-HEXANONE	UG/L	20 U	20 U	20 U	20 U	20 U
4-CHLOROTOLUENE	UG/L	2 U	2 U	2 U	2 U	2 U
4-METHYL-2-PENTANONE	UG/L	20 U	20 U	20 U	20 U	20 U
ACETONE	UG/L					
BENZENE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
BROMOBENZENE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
BROMOCHLOROMETHANE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
BROMODICHLOROMETHANE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
BROMOFORM	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
BROMOMETHANE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
CARBON DISULFIDE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
CARBON TETRACHLORIDE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
CHLOROBENZENE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
CHLORODIBROMOMETHANE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
CHLOROETHANE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
CHLOROFORM	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
CHLOROMETHANE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
CIS-1,3-DICHLOROPROPENE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
DIBROMOMETHANE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
DICHLORODIFLUOROMETHANE	UG/L	.5 UJ	.5 UJ	.5 UJ	.5 UJ	.5 U
ETHYLBENZENE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
HEXACHLOROBUTADIENE	UG/L	2 U	2 U	2 U	2 U	2 U
ISOPROPYLBENZENE	UG/L	2 U	2 U	2 U	2 U	2 U
METHYLENE CHLORIDE	UG/L	.2 J	1 U	.3 J	1 U	1 U
N-BUTYLBENZENE	UG/L	2 U	2 U	2 U	2 U	2 U
N-PROPYLBENZENE	UG/L	2 U	2 U	2 U	2 U	2 U
NAPHTHALENE	UG/L	2 U	2 U	2 U	2 U	2 U
P-ISOPROPYLTOLUENE	UG/L	2 U	2 U	2 U	2 U	2 U
SEC-BUTYLBENZENE	UG/L	2 U	2 U	2 U	2 U	2 U
SEC-DICHLOROPROPANE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
STYRENE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
TERT-BUTYLBENZENE	UG/L	2 U	2 U	2 U	2 U	2 U
TETRACHLOROETHENE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
TOLUENE	UG/L	.5 U	.5 U	.5 U	.5 U	.6 J
TOTAL XYLENES	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
TRANS-1,3-DICHLOROPROPENE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
TRICHLOROETHENE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
TRICHLOROFLUOROMETHANE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
VINYL CHLORIDE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U

ANALYTE_NAME	UNITS	PW-18 147P185 REG 2/12/98	PW-19 147P191 REG 2/13/98	PW-19 147P195 REG 2/13/98	PW-20 147P201 REG 2/13/98	PW-20 147P205 REG 2/13/98
1,1,1,2-TETRACHLOROETHANE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
1,1,1-TRICHLOROETHANE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
1,1,2,2-TETRACHLOROETHANE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
1,1,2-TRICHLOROETHANE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
1,1-DICHLOROETHANE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
1,1-DICHLOROETHENE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
1,1-DICHLOROPROPENE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
1,2,3-TRICHLOROBENZENE	UG/L	2 U	2 U	2 UJ	2 U	2 U
1,2,3-TRICHLOROPROPANE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
1,2,4-TRICHLOROBENZENE	UG/L	2 U	2 U	2 UJ	2 U	2 U
1,2,4-TRIMETHYLBENZENE	UG/L	2 U	2 U	2 U	2 U	2 U
1,2-DIBROMO-3-CHLOROPROPANE	UG/L	2 U	2 U	2 U	2 U	2 U
1,2-DIBROMOETHANE	UG/L	2 U	2 U	2 U	2 U	2 U
1,2-DICHLOROBENZENE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
1,2-DICHLOROETHANE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
1,2-DICHLOROETHYLENE	UG/L	.6	.5 U	.6	.5 U	.5 U
1,2-DICHLOROPROPANE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
1,3,5-TRIMETHYLBENZENE	UG/L	2 U	2 U	2 U	2 U	2 U
1,3-DICHLOROBENZENE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
1,3-DICHLOROPROPANE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
1,4-DICHLOROBENZENE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
2-BUTANONE	UG/L	20 U	20 U	20 U	20 U	20 U
2-CHLOROTOLUENE	UG/L	2 U	2 U	2 U	2 U	2 U
2-HEXANONE	UG/L	20 U	20 U	20 U	20 U	20 U
4-CHLOROTOLUENE	UG/L	2 U	2 U	2 U	2 U	2 U
4-METHYL-2-PENTANONE	UG/L	20 U	20 U	20 U	20 U	20 U
ACETONE	UG/L					
BENZENE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
BROMOBENZENE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
BROMOCHLOROMETHANE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
BROMODICHLOROMETHANE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
BROMOFORM	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
BROMOMETHANE	UG/L	.5 U	.5 U	.5 UJ	.5 U	.5 U
CARBON DISULFIDE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
CARBON TETRACHLORIDE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
CHLOROBENZENE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
CHLORODIBROMOMETHANE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
CHLOROETHANE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
CHLOROFORM	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
CHLOROMETHANE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
CIS-1,3-DICHLOROPROPENE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
DIBROMOMETHANE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
DICHLORODIFLUOROMETHANE	UG/L	.5 UJ	.5 UJ	.5 UJ	.5 UJ	.5 UJ
ETHYLBENZENE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
HEXACHLOROBUTADIENE	UG/L	2 U	2 U	2 U	2 U	2 U
ISOPROPYLBENZENE	UG/L	2 U	2 U	2 U	2 U	2 U
METHYLENE CHLORIDE	UG/L	1 U	1 U	1 U	1 U	1 U
N-BUTYLBENZENE	UG/L	2 U	2 U	2 UJ	2 U	2 U
N-PROPYLBENZENE	UG/L	2 U	2 U	2 U	2 U	2 U
NAPHTHALENE	UG/L	2 U	2 U	2 UJ	2 U	2 U
P-ISOPROPYLTOLUENE	UG/L	2 U	2 U	2 U	2 U	2 U
SEC-BUTYLBENZENE	UG/L	2 U	2 U	2 U	2 U	2 U
SEC-DICHLOROPROPANE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
STYRENE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
TERT-BUTYLBENZENE	UG/L	2 U	2 U	2 U	2 U	2 U
TETRACHLOROETHENE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
TOLUENE	UG/L	.5 U	.5 U	.5 U	.05 J	.5 U
TOTAL XYLENES	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
TRANS-1,3-DICHLOROPROPENE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
TRICHLOROETHENE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
TRICHLOROFLUOROMETHANE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U
VINYL CHLORIDE	UG/L	.5 U	.5 U	.5 U	.5 U	.5 U

APPENDIX B

SEEPAGE AND FLUX SPREADSHEETS

Site		PW2
Deplov Start Time	id	114.61
Deployment End Time	jd	115.14
Sample Interval	days	0.08681
Chamber Area	cm2	1698.23
Water Density	g/cm3	1.024
Sediment Porosity		0.3
Chamber Depth Penetration	cm	0.875
Chamber volume	ml	1485.95
Ambient TCE Concentration	ug/L	0.1
Ambient 1,2-DCE Concentration	ug/L	7.9
Ambient 1,1-DCE Concentration	ug/L	2.1
Ambient VC Concentration	ug/L	0.6
Prefill Concentration	ug/L	0
Site Area	m2	2090.32

Sample number		1	2	3	4	5	6
Sample Start Time	id	114.61	114.70	114.79	114.88	114.96	115.05
Sample Mid Time	jd	114.66	114.74	114.83	114.92	115.01	115.09
Sample End Time	jd	114.70	114.79	114.88	114.96	115.05	115.14
Delta Time	days	0.08681	0.08681	0.08681	0.08681	0.08681	0.08681
Start Weight Dry	g	25.69	25.56	25.87	25.93	26.04	25.73
Start Weight Wet	g	125.67	129.08	128.99	131.84	123.25	128.4
End Weight	g	285.42	71.55	67.3	109.64	252.59	486.41
Delta Weight	g	159.75	-57.53	-61.69	-22.2	129.34	358.01
Delta Volume	cm3	156.01	-56.18	-60.24	-21.68	126.31	349.62
Seepage Rate	cm3/cm2/day	1.05827	-0.38111	-0.40867	-0.14707	0.85682	2.37166
Seepage Velocity	ft/day	0.11573	-0.04168	-0.04469	-0.01608	0.09370	0.25937

No Flux Times	id	1.14E+02	114.875	1.16E+02
No Flux Limit - Seepage Rate	cm3/cm2/day	0.01707	0.01707	0.01707
No Flux Limit - Seepage Velocity	ft/day	0.00187	0.00187	0.00187
Tidal Average Seepage Rate	cm3/cm2/day	0.55832	0.55832	0.55832
Minimum Seepage Rate	cm3/cm2/day	-0.40867	-0.40867	-0.40867
Maximum Seepage Rate	cm3/cm2/day	2.37166	2.37166	2.37166
Tidal Average Seepage Velocity	ft/day	0.06106	0.06106	0.06106
Outward Seepage Rate	cm3/cm2/day	0.71446	0.71446	0.71446
Outward Seepage Velocity	ft/day	0.07813	0.07813	0.07813
Outward Flow	L/day	14934.45	14934.45	14934.45
Outward Flow	GPM	2.74	2.74	2.74

Flux Calculation 1,2-DCE

Sample Number		147B02101	147B02201	147B02301	147B02401	147B02501	147B02601
Bag Initial Volume	ml	110.64	113.09	113.70	113.43	104.93	113.26
Bag Initial C	ug/l	0	0	0	0	0	0
Bag Final Volume	ml	266.64	56.91	53.46	91.75	231.24	462.88
Bag Final C	ug/l	4.4	0	0	0	14	32
Outlet Volume	ml	13	12	13	10	10	13
Inlet Volume	ml	60	60	60	60	60	60
Chamber Volume	ml	1545.95	1545.95	1545.95	1545.95	1545.95	1545.95
Chamber Initial C	ug/l	7.90	7.52	7.26	6.98	6.89	25.63
Chamber Final C	ug/l	7.52	7.26	6.98	6.89	25.63	42.37
Seep Volume	ml	156.01	-56.18	-60.24	-21.68	126.31	349.62
Seep C	ug/l	3.76	7.26	6.98	6.89	255.03	116.37
Seep C w/zero	ug/l	3.76	0.00	0.00	0.00	255.03	116.37

Flux Calculation 1,1-DCE

Sample Number		147B02101	147B02201	147B02301	147B02401	147B02501	147B02601
Bag Initial Volume	ml	110.64	113.09	113.70	113.43	104.93	113.26
Bag Initial C	ug/l	0	0	0	0	0	0
Bag Final Volume	ml	266.64	56.91	53.46	91.75	231.24	462.88
Bag Final C	ug/l	0.9	0	0	0	1.2	2.4
Outlet Volume	ml	13	12	13	10	10	13
Inlet Volume	ml	60	60	60	60	60	60
Chamber Volume	ml	1545.95	1545.95	1545.95	1545.95	1545.95	1545.95
Chamber Initial C	ug/l	2.10	1.54	1.48	1.43	1.41	2.20
Chamber Final C	ug/l	1.54	1.48	1.43	1.41	2.20	3.18
Seep Volume	ml	156.01	-56.18	-60.24	-21.68	126.31	349.62
1,1-DCE:1,2-DCE Ratio		na	na	na	na	na	na
Seep C	ug/l	-4.02828	1.48	1.43	1.41	11.84	7.51
Seep C w/zero	ug/l	0	0	0	0	11.84	7.51

Flux Calculation VC

Sample Number		147B02101	147B02201	147B02301	147B02401	147B02501	147B02601
Bag Initial Volume	ml	110.64	113.09	113.70	113.43	104.93	113.26
Bag Initial C	ug/l	0	0	0	0	0	0
Bag Final Volume	ml	266.64	56.91	53.46	91.75	231.24	462.88
Bag Final C	ug/l	2.6	0	0	0	17	36
Outlet Volume	ml	13	12	13	10	10	13
Inlet Volume	ml	60	60	60	60	60	60
Chamber Volume	ml	1545.95	1545.95	1545.95	1545.95	1545.95	1545.95
Chamber Initial C	ug/l	0.60	4.44	4.29	4.13	4.07	31.12
Chamber Final C	ug/l	4.44	4.29	4.13	4.07	31.12	47.66
Seep Volume	ml	156.01	-56.18	-60.24	-21.68	126.31	349.62
Seep C	ug/l	42.53	4.29	4.13	4.07	362.23	120.80
Seep C w/zero	ug/l	42.53498064	0	0	0	362.233523	120.79855

Flux Calculation TCE

Sample Number		147B02101	147B02201	147B02301	147B02401	147B02501	147B02601
Bag Initial Volume	ml	110.64	113.09	113.70	113.43	104.93	113.26
Bag Initial C	ug/l	0	0	0	0	0	0
Bag Final Volume	ml	266.64	56.91	53.46	91.75	231.24	462.88
Bag Final C	ug/l	0.05	0	0	0	0.05596	0.1
Outlet Volume	ml	13	12	13	10	10	13
Inlet Volume	ml	60	60	60	60	60	60
Chamber Volume	ml	1545.95	1545.95	1545.95	1545.95	1545.95	1545.95
Chamber Initial C	ug/l	0.10000	0.08546	0.08246	0.07937	0.07827	0.10246
Chamber Final C	ug/l	0.08546	0.08246	0.07937	0.07827	0.102458	0.13240
Seep Volume	ml	156.01	-56.18	-60.24	-21.68	126.31	349.62
TCE:1,2-DCE Ratio		na	na	na	na	1.563E-03	na
Seep C	ug/l	-0.05863	0.08246	0.07937	0.07827	0.39849	0.26478
Seep C w/zero	ug/l	0	0	0	0	0.39849	0.26478

Average 1,2-DCE	ug/L	125.05
Average 1,1-DCE	ug/L	6.45
Average VC	ug/L	175.19
Average TCE	ug/L	0.22109

Site		PW3R
Deplov Start Time	id	115.62
Deployment End Time	jd	116.14
Sample Interval	days	0.08681
Chamber Area	cm2	1698.23
Water Density	g/cm3	1.024
Sediment Porosity		0.3
Chamber Depth Penetration	cm	0.875
Chamber volume	ml	1485.95
Ambient TCE Concentration	ug/L	0
Ambient 1,2-DCE Concentration	ug/L	0
Ambient 1,1-DCE Concentration	ug/L	0
Ambient VC Concentration	ug/L	0
Prefill Concentration	ug/L	0
Site Area	m2	2090.32

Sample number		1	2	3	4	5	6
Sample Start Time	id	115.62	115.71	115.80	115.88	115.97	116.06
Sample Mid Time	jd	115.67	115.75	115.84	115.93	116.01	116.10
Sample End Time	jd	115.71	115.80	115.88	115.97	116.06	116.14
Delta Time	days	0.08681	0.08681	0.08681	0.08681	0.08681	0.08681
Start Weight Dry	g	25.66	25.60	25.61	25.48	25.74	25.67
Start Weight Wet	g	135.05	132.72	134.44	131.58	131.26	134.95
End Weight	g	252.94	128.70	80.95	137.13	354.33	1062.10
Delta Weight	g	117.89	-4.02	-53.49	5.55	223.07	927.15
Delta Volume	cm3	115.13	-3.93	-52.24	5.42	217.84	905.42
Seepage Rate	cm3/cm2/day	0.78097	-0.02663	-0.35435	0.03677	1.47774	6.14196
Seepage Velocity	ft/day	0.08541	-0.00291	-0.03875	0.00402	0.16161	0.67169

No Flux Times	id	1.15E+02	115.8833	1.17E+02
No Flux Limit - Seepage Rate	cm3/cm2/day	0.01707	0.01707	0.01707
No Flux Limit - Seepage Velocity	ft/day	0.00187	0.00187	0.00187
Tidal Average Seepage Rate	cm3/cm2/day	1.34	1.34	1.34
Minimum Seepage Rate	cm3/cm2/day	-0.35435	-0.35435	-0.35435
Maximum Seepage Rate	cm3/cm2/day	6.14	6.14	6.14
Tidal Average Seepage Velocity	ft/day	0.14684	0.14684	0.14684
Outward Seepage Rate	cm3/cm2/day	1.41	1.41	1.41
Outward Seepage Velocity	ft/day	0.15379	0.15379	0.15379
Outward Flow	L/day	29394.86	29394.86	29394.86
Outward Flow	GPM	5.39	5.39	5.39

Flux Calculation 1,2-DCE

Sample Number		147B03101	147B03201	147B03301	147B03401	147B03501	147B03601
Bag Initial Volume	ml	119.83	116.61	119.28	113.61	113.05	119.72
Bag Initial C	ug/l	0	0	0	0	0	0
Bag Final Volume	ml	234.95	112.68	67.04	119.03	330.89	1025.14
Bag Final C	ug/l	11	0	0	[redacted]	74	150
Outlet Volume	ml	13	12	13	10	10	13
Inlet Volume	ml	60	60	60	60	60	60
Chamber Volume	ml	1545.95	1545.95	1545.95	1545.95	1545.95	1545.95
Chamber Initial C	ug/l	0.00	22.45	22.39	21.66	23.14	112.40
Chamber Final C	ug/l	22.45	22.39	21.66	23.14	112.40	169.83
Seep Volume	ml	115.13	-3.93	-52.24	5.42	217.84	905.42
Seep C	ug/l	323.90	22.39	21.66	445.87	745.84	267.90
Seep C w/zero	ug/l	323.90	0.00	0.00	[redacted]	745.84	267.90

Flux Calculation 1,1-DCE

Sample Number		147B03101	147B03201	147B03301	147B03401	147B03501	147B03601
Bag Initial Volume	ml	119.83	116.61	119.28	113.61	113.05	119.72
Bag Initial C	ug/l	0	0	0	0	0	0
Bag Final Volume	ml	234.95	112.68	67.04	119.03	330.89	1025.14
Bag Final C	ug/l	3.5	0	0	[redacted]	24	42
Outlet Volume	ml	13	12	13	10	10	13
Inlet Volume	ml	60	60	60	60	60	60
Chamber Volume	ml	1545.95	1545.95	1545.95	1545.95	1545.95	1545.95
Chamber Initial C	ug/l	0.00	7.14	7.12	6.89	7.35	36.45
Chamber Final C	ug/l	7.14	7.12	6.89	7.35	36.45	47.55
Seep Volume	ml	115.13	-3.93	-52.24	5.42	217.84	905.42
1,1-DCE:1,2-DCE Ratio		na	na	na	na	na	na
Seep C	ug/l	103.06	7.12	6.89	137.60	243.01	66.50
Seep C w/zero	ug/l	103.06	0.00	0.00	[redacted]	243.01	66.50

Flux Calculation VC

Sample Number		147B03101	147B03201	147B03301	147B03401	147B03501	147B03601
Bag Initial Volume	ml	119.83	116.61	119.28	113.61	113.05	119.72
Bag Initial C	ug/l	0	0	0	0	0	0
Bag Final Volume	ml	234.95	112.68	67.04	119.03	330.89	1025.14
Bag Final C	ug/l	1.6	0	0	[illegible]	11	20
Outlet Volume	ml	13	12	13	10	10	13
Inlet Volume	ml	60	60	60	60	60	60
Chamber Volume	ml	1545.95	1545.95	1545.95	1545.95	1545.95	1545.95
Chamber Initial C	ug/l	0.00	3.27	3.26	3.15	3.36	16.71
Chamber Final C	ug/l	3.27	3.26	3.15	3.36	16.71	22.64
Seep Volume	ml	115.13	-3.93	-52.24	5.42	217.84	905.42
Seep C	ug/l	47.11	3.26	3.15	63.78	111.42	32.78
Seep C w/zero	ug/l	47.11	0.00	0.00	[illegible]	111.42	32.78

Flux Calculation TCE

Sample Number		147B03101	147B03201	147B03301	147B03401	147B03501	147B03601
Bag Initial Volume	ml	119.83	116.61	119.28	113.61	113.05	119.72
Bag Initial C	ug/l	0	0	0	0	0	0
Bag Final Volume	ml	234.95	112.68	67.04	119.03	330.89	1025.14
Bag Final C	ug/l	0.00367	0	0	[illegible]	0.02468	0.05
Outlet Volume	ml	13	12	13	10	10	13
Inlet Volume	ml	60	60	60	60	60	60
Chamber Volume	ml	1545.95	1545.95	1545.95	1545.95	1545.95	1545.95
Chamber Initial C	ug/l	0.00	0.01	0.01	0.01	0.01	0.04
Chamber Final C	ug/l	0.007483	0.01	0.01	0.01	0.037482	0.06
Seep Volume	ml	115.13	-3.93	-52.24	5.42	217.84	905.42
TCE:1,2-DCE Ratio		3.333E-04	na	na	na	3.333E-04	na
Seep C	ug/l	0.10797	0.01	0.01	0.15	0.24861	0.09
Seep C w/zero	ug/l	0.11	0.00	0.00	[illegible]	0.25	0.09

Average 1,2-DCE	ug/L	445.88
Average 1,1-DCE	ug/L	137.54
Average VC	ug/L	63.77
Average TCE	ug/L	0.15

Site		PW4
Deplov Start Time	id	116.69
Deployment End Time	jd	117.21
Sample Interval	days	0.08681
Chamber Area	cm2	1698.23
Water Density	g/cm3	1.02400
Sediment Porosity		0.3
Chamber Depth Penetration	cm	0.88
Chamber volume	ml	1485.95
Ambient C	ug/L	0
Site Area	m2	2322.58

Sample number		1	2	3	4	5	6
Sample Start Time	id	116.69	116.77	116.86	116.95	117.03	117.12
Sample Mid Time	jd	116.73	116.82	116.90	116.99	117.08	117.16
Sample End Time	jd	116.77	116.86	116.95	117.03	117.12	117.21
Delta Time	days	0.08681	0.08681	0.08681	0.08681	0.08681	0.08681
Start Weight Dry	g	25.21	25.17	25.21	25.47	25.21	25.52
Start Weight Wet	g	131.81	131.57	128.92	126.38	129.91	135.67
End Weight	g	173.10	94.08	72.25	94.91	168.15	321.24
Delta Weight	g	41.29	-37.49	-56.67	-31.47	38.24	185.57
Delta Volume	cm3	40.32	-36.61	-55.34	-30.73	37.34	181.22
Seepage Rate	cm3/cm2/day	0.27353	-0.24835	-0.37541	-0.20847	0.25332	1.22932
Seepage Velocity	ft/day	0.02991	-0.02716	-0.04106	-0.02280	0.02770	0.13444

No Flux Times	id	1.16E+02	116.94583	1.18E+02
No Flux Limit - Seepage Rate	cm3/cm2/day	0.01707	0.01707	0.01707
No Flux Limit - Seepage Velocity	ft/day	0.00187	0.00187	0.00187
Tidal Average Seepage Rate	cm3/cm2/day	0.15399	0.15399	0.15399
Minimum Seepage Rate	cm3/cm2/day	-0.37541	-0.37541	-0.37541
Maximum Seepage Rate	cm3/cm2/day	1.23	1.23	1.23
Tidal Average Seepage Velocity	ft/day	0.01684	0.01684	0.01684
Outward Seepage Rate	cm3/cm2/day	0.29269	0.29269	0.29269
Outward Seepage Velocity	ft/day	0.03201	0.03201	0.03201
Outward Flow	L/day	6798.06	6798.06	6798.06
Outward Flow	GPM	1.25	1.25	1.25

Site		PW12
Deplov Start Time	id	114.65
Deployment End Time	jd	115.17
Sample Interval	days	0.08681
Chamber Area	cm2	1698.23
Water Density	g/cm3	1.02400
Sediment Porosity		0.3
Chamber Depth Penetration	cm	0.875
Chamber volume	ml	1485.95
Ambient C	ug/L	0
Site Area	m2	1741.93

Sample number		1	2	3	4	5	6
Sample Start Time	id	114.65	114.73	114.82	114.91	114.99	115.08
Sample Mid Time	jd	114.69	114.78	114.86	114.95	115.04	115.12
Sample End Time	jd	114.73	114.82	114.91	114.99	115.08	115.17
Delta Time	days	0.08681	0.08681	0.08681	0.08681	0.08681	0.08681
Start Weight Dry	g	25.83	25.84	25.94	25.78	25.04	25.32
Start Weight Wet	g	126.78	126.49	127.14	126.35	129.66	130.78
End Weight	g	150.65	59.26	98.26	148.33	177.03	321.95
Delta Weight	g	23.87	-67.23	-28.88	21.98	47.37	191.17
Delta Volume	cm3	23.31	-65.65	-28.20	21.46	46.26	186.69
Seepage Rate	cm3/cm2/day	0.15813	-0.44537	-0.19132	0.14561	0.31381	1.26642
Seepage Velocity	ft/day	0.01729	-0.04871	-0.02092	0.01592	0.03432	0.13850

No Flux Times	id	1.14E+02	114.908	1.16E+02
No Flux Limit - Seepage Rate	cm3/cm2/day	0.01707	0.01707	0.01707
No Flux Limit - Seepage Velocity	ft/day	0.00187	0.00187	0.00187
Tidal Average Seepage Rate	cm3/cm2/day	0.20788	0.20788	0.20788
Minimum Seepage Rate	cm3/cm2/day	-0.44537	-0.44537	-0.44537
Maximum Seepage Rate	cm3/cm2/day	1.27	1.27	1.27
Tidal Average Seepage Velocity	ft/day	0.02273	0.02273	0.02273
Outward Seepage Rate	cm3/cm2/day	0.31399	0.31399	0.31399
Outward Seepage Velocity	ft/day	0.03434	0.03434	0.03434
Outward Flow	L/day	5469.54	5469.54	5469.54
Outward Flow	GPM	1.00	1.00	1.00

Site		PW13
Deplov Start Time	id	116.65
Deployment End Time	jd	117.17
Sample Interval	days	0.08681
Chamber Area	cm2	1698.227179
Water Density	g/cm3	1.024
Sediment Porosity		0.3
Chamber Depth Penetration	cm	0.875
Chamber volume	ml	1485.95
Ambient TCE Concentration	ug/L	0
Ambient 1,2-DCE Concentration	ug/L	0
Ambient 1,1-DCE Concentration	ug/L	0
Ambient VC Concentration	ug/L	0
Prefill Concentration	ug/L	0
Site Area	m2	3135.48

Sample number		1	2	3	4	5	6
Sample Start Time	id	116.65	116.74	116.83	116.91	117.00	117.09
Sample Mid Time	jd	116.70	116.78	116.87	116.96	117.04	117.13
Sample End Time	jd	116.74	116.83	116.91	117.00	117.09	117.17
Delta Time	days	0.08681	0.08681	0.08681	0.08681	0.08681	0.08681
Start Weight Dry	g	25.35	25.16	25.24	25.5	25.43	25.22
Start Weight Wet	g	134.19	130.57	132.13	128.81	131.03	125.55
End Weight	g	378.35	676.43	1519.31	666.8	832.5	482.03
Delta Weight	g	244.16	545.86	1387.18	537.99	701.47	356.48
Delta Volume	cm3	238.44	533.07	1354.67	525.38	685.03	348.13
Seepage Rate	cm3/cm2/day	1.61745	3.61608	9.18945	3.56394	4.64693	2.36152
Seepage Velocity	ft/day	0.17689	0.39546	1.00497	0.38976	0.50819	0.25826

No Flux Times	id	1.16E+02	116.9138889	1.18E+02
No Flux Limit - Seepage Rate	cm3/cm2/day	0.01707	0.01707	0.01707
No Flux Limit - Seepage Velocity	ft/day	0.00187	0.00187	0.00187
Tidal Average Seepage Rate	cm3/cm2/day	4.16590	4.16590	4.16590
Minimum Seepage Rate	cm3/cm2/day	1.61745	1.61745	1.61745
Maximum Seepage Rate	cm3/cm2/day	9.18945	9.18945	9.18945
Tidal Average Seepage Velocity	ft/day	0.45559	0.45559	0.45559
Outward Seepage Rate	cm3/cm2/day	4.16590	4.16590	4.16590
Outward Seepage Velocity	ft/day	0.45559	0.45559	0.45559
Outward Flow	L/day	130620.73	130620.73	130620.73
Outward Flow	GPM	23.96	23.96	23.96

Flux Calculation 1,2-DCE

Sample Number		147B02101	147B02201	147B02301	147B02401	147B02501	147B02601
Bag Initial Volume	ml	119.29	114.94	117.38	110.89	113.13	110.98
Bag Initial C	ug/l	0	0	0	0	0	0
Bag Final Volume	ml	357.73	648.01	1472.05	636.27	798.15	459.10
Bag Final C	ug/l	3.1	7.9	8.7	5.2	5.1	4.1
Outlet Volume	ml	13	12	13	10	10	13
Inlet Volume	ml	60	60	60	60	60	60
Chamber Volume	ml	1545.95	1545.95	1545.95	1545.95	1545.95	1545.95
Chamber Initial C	ug/l	0.00	4.65	9.60	9.45	6.30	5.94
Chamber Final C	ug/l	4.65	9.60	9.45	6.30	5.94	5.41
Seep Volume	ml	238.44	533.07	1354.67	525.38	685.03	348.13
Seep C	ug/l	34.81	23.97	9.28	-2.99	5.14	3.03
Seep C w/zero	ug/l	34.80588168	23.9661045	9.28324016	0	5.14033279	3.0304493

Flux Calculation 1,1-DCE

Sample Number		147B02101	147B02201	147B02301	147B02401	147B02501	147B02601
Bag Initial Volume	ml	119.29	114.94	117.38	110.89	113.13	110.98
Bag Initial C	ug/l	0	0	0	0	0	0
Bag Final Volume	ml	357.73	648.01	1472.05	636.27	798.15	459.10
Bag Final C	ug/l	1.8	5.1	5.4	3.5	3.4	2.8
Outlet Volume	ml	13	12	13	10	10	13
Inlet Volume	ml	60	60	60	60	60	60
Chamber Volume	ml	1545.95	1545.95	1545.95	1545.95	1545.95	1545.95
Chamber Initial C	ug/l	0.00	2.70	6.20	5.87	4.24	3.96
Chamber Final C	ug/l	2.70	6.20	5.87	4.24	3.96	3.69
Seep Volume	ml	238.44	533.07	1354.67	525.38	685.03	348.13
1,1-DCE:1,2-DCE Ratio		na	na	na	na	na	na
Seep C	ug/l	20.20987	16.35	5.49	-0.56	3.34	2.50
Seep C w/zero	ug/l	20.20986678	16.34749927	5.48934154	0	3.34	2.50

Flux Calculation VC

Sample Number		147B02101	147B02201	147B02301	147B02401	147B02501	147B02601
Bag Initial Volume	ml	119.29	114.94	117.38	110.89	113.13	110.98
Bag Initial C	ug/l	0	0	0	0	0	0
Bag Final Volume	ml	357.73	648.01	1472.05	636.27	798.15	459.10
Bag Final C	ug/l	0.6	1.4	1.4	1	1	1
Outlet Volume	ml	13	12	13	10	10	13
Inlet Volume	ml	60	60	60	60	60	60
Chamber Volume	ml	1545.95	1545.95	1545.95	1545.95	1545.95	1545.95
Chamber Initial C	ug/l	0.00	0.90	1.70	1.52	1.21	1.17
Chamber Final C	ug/l	0.90	1.70	1.52	1.21	1.17	1.32
Seep Volume	ml	238.44	533.07	1354.67	525.38	685.03	348.13
Seep C	ug/l	6.74	4.03	1.32	0.30	1.06	2.00
Seep C w/zero	ug/l	6.74	4.03	1.32	0.30	1.06	2.00

Flux Calculation TCE

Sample Number		147B02101	147B02201	147B02301	147B02401	147B02501	147B02601
Bag Initial Volume	ml	119.29	114.94	117.38	110.89	113.13	110.98
Bag Initial C	ug/l	0	0	0	0	0	0
Bag Final Volume	ml	357.73	648.01	1472.05	636.27	798.15	459.10
Bag Final C	ug/l	0	0	0	0	0	0
Outlet Volume	ml	13	12	13	10	10	13
Inlet Volume	ml	60	60	60	60	60	60
Chamber Volume	ml	1545.95	1545.95	1545.95	1545.95	1545.95	1545.95
Chamber Initial C	ug/l	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Chamber Final C	ug/l	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Seep Volume	ml	238.44	533.07	1354.67	525.38	685.03	348.13
TCE:1,2-DCE Ratio		na	na	na	na	na	na
Seep C	ug/l	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Seep C w/zero	ug/l	0	0	0	0	0	0

Average 1,2-DCE	ug/L	14.33
Average 1,1-DCE	ug/L	8.68
Average VC	ug/L	3.27
Average TCE	ug/L	0.00000

Site		PW14
Deplov Start Time	id	115.63
Deployment End Time	jd	116.15
Sample Interval	days	0.08681
Chamber Area	cm2	1698.23
Water Density	g/cm3	1.024
Sediment Porosity		0.3
Chamber Depth Penetration	cm	0.875
Chamber volume	ml	1485.95
Ambient TCE Concentration	ug/L	0
Ambient 1,2-DCE Concentration	ug/L	0
Ambient 1,1-DCE Concentration	ug/L	0
Ambient VC Concentration	ug/L	0
Prefill Concentration	ug/L	0
Site Area	m2	1393.55

Sample number		1	2	3	4	5	6
Sample Start Time	id	115.63	115.72	115.81	115.89	115.98	116.07
Sample Mid Time	jd	115.68	115.76	115.85	115.94	116.02	116.11
Sample End Time	jd	115.72	115.81	115.89	115.98	116.07	116.15
Delta Time	days	0.08681	0.08681	0.08681	0.08681	0.08681	0.08681
Start Weight Dry	g	25.62	25.05	25.67	25.24	25.15	25.91
Start Weight Wet	g	126.17	128.67	136.9	127.1	129.24	128.52
End Weight	g	48.02	66.28	46.57	50.07	274.99	795.9
Delta Weight	g	-78.15	-62.39	-90.33	-77.03	145.75	667.38
Delta Volume	cm3	-76.32	-60.93	-88.21	-75.22	142.33	651.74
Seepage Rate	cm3/cm2/day	-0.51771	-0.41331	-0.59840	-0.51029	0.96553	4.42110
Seepage Velocity	ft/day	-0.05662	-0.04520	-0.06544	-0.05581	0.10559	0.48350

No Flux Times	id	1.15E+02	115.8923611	1.17E+02
No Flux Limit - Seepage Rate	cm3/cm2/day	0.01707	0.01707	0.01707
No Flux Limit - Seepage Velocity	ft/day	0.00187	0.00187	0.00187
Tidal Average Seepage Rate	cm3/cm2/day	0.55782	0.55782	0.55782
Minimum Seepage Rate	cm3/cm2/day	-0.59840	-0.59840	-0.59840
Maximum Seepage Rate	cm3/cm2/day	4.42110	4.42110	4.42110
Tidal Average Seepage Velocity	ft/day	0.06100	0.06100	0.06100
Outward Seepage Rate	cm3/cm2/day	0.89777	0.89777	0.89777
Outward Seepage Velocity	ft/day	0.09818	0.09818	0.09818
Outward Flow	L/day	12510.85	12510.85	12510.85
Outward Flow	GPM	2.29	2.29	2.29

Flux Calculation 1,2-DCE

Sample Number		147B02101	147B02201	147B02301	147B02401	147B02501	147B02601
Bag Initial Volume	ml	111.19	113.19	121.62	109.47	111.65	113.21
Bag Initial C	ug/l	0	0	0	0	0	0
Bag Final Volume	ml	34.88	52.26	33.41	34.25	253.98	764.94
Bag Final C	ug/l	0	0	0	0	0	0
Outlet Volume	ml	13	12	13	10	10	13
Inlet Volume	ml	60	60	60	60	60	60
Chamber Volume	ml	1545.95	1545.95	1545.95	1545.95	1545.95	1545.95
Chamber Initial C	ug/l	0.00	0.00	0.00	0.00	0.00	0.00
Chamber Final C	ug/l	0.00	0.00	0.00	0.00	0.00	0.00
Seep Volume	ml	-76.32	-60.93	-88.21	-75.22	142.33	651.74
Seep C	ug/l	0.00	0.00	0.00	0.00	0.00	0.00
Seep C w/zero	ug/l	0	0	0	0	0	0

Flux Calculation 1,1-DCE

Sample Number		147B02101	147B02201	147B02301	147B02401	147B02501	147B02601
Bag Initial Volume	ml	111.19	113.19	121.62	109.47	111.65	113.21
Bag Initial C	ug/l	0	0	0	0	0	0
Bag Final Volume	ml	34.88	52.26	33.41	34.25	253.98	764.94
Bag Final C	ug/l	0.0	0	0	0	0	0
Outlet Volume	ml	13	12	13	10	10	13
Inlet Volume	ml	60	60	60	60	60	60
Chamber Volume	ml	1545.95	1545.95	1545.95	1545.95	1545.95	1545.95
Chamber Initial C	ug/l	0.00	0.00	0.00	0.00	0.00	0.00
Chamber Final C	ug/l	0.00	0.00	0.00	0.00	0.00	0.00
Seep Volume	ml	-76.32	-60.93	-88.21	-75.22	142.33	651.74
1,1-DCE:1,2-DCE Ratio		na	na	na	na	na	na
Seep C	ug/l	0.00000	0.00	0.00	0.00	0.00	0.00
Seep C w/zero	ug/l	0	0	0	0	0.00	0.00

Flux Calculation VC

Sample Number		147B02101	147B02201	147B02301	147B02401	147B02501	147B02601
Bag Initial Volume	ml	111.19	113.19	121.62	109.47	111.65	113.21
Bag Initial C	ug/l	0	0	0	0	0	0
Bag Final Volume	ml	34.88	52.26	33.41	34.25	253.98	764.94
Bag Final C	ug/l	0	0	0	0	0.2	0.4
Outlet Volume	ml	13	12	13	10	10	13
Inlet Volume	ml	60	60	60	60	60	60
Chamber Volume	ml	1545.95	1545.95	1545.95	1545.95	1545.95	1545.95
Chamber Initial C	ug/l	0.00	0.00	0.00	0.00	0.00	0.36
Chamber Final C	ug/l	0.00	0.00	0.00	0.00	0.36	0.47
Seep Volume	ml	-76.32	-60.93	-88.21	-75.22	142.33	651.74
Seep C	ug/l	0.00	0.00	0.00	0.00	4.23	0.74
Seep C w/zero	ug/l	0.00	0.00	0.00	0.00	4.23	0.74

Flux Calculation TCE

Sample Number		147B02101	147B02201	147B02301	147B02401	147B02501	147B02601
Bag Initial Volume	ml	111.19	113.19	121.62	109.47	111.65	113.21
Bag Initial C	ug/l	0	0	0	0	0	0
Bag Final Volume	ml	34.88	52.26	33.41	34.25	253.98	764.94
Bag Final C	ug/l	0	0	0	0	0	0
Outlet Volume	ml	13	12	13	10	10	13
Inlet Volume	ml	60	60	60	60	60	60
Chamber Volume	ml	1545.95	1545.95	1545.95	1545.95	1545.95	1545.95
Chamber Initial C	ug/l	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Chamber Final C	ug/l	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Seep Volume	ml	-76.32	-60.93	-88.21	-75.22	142.33	651.74
TCE:1,2-DCE Ratio		na	na	na	na	na	na
Seep C	ug/l	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Seep C w/zero	ug/l	0	0	0	0	0	0

Average 1,2-DCE	ug/L	0.00
Average 1,1-DCE	ug/L	0.00
Average VC	ug/L	1.66
Average TCE	ug/L	0.00000

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13. ABSTRACT *(Maximum 200 words)*

Porewater measurements at 20 offshore stations at North Island, IR Site 9, indicate that elevated levels of VOCs are present in a tightly restricted area near the southern reach of Bravo Pier. The highest levels were always observed at the deepest measurement points, indicating that the concentrations are significantly attenuated within the sediment before entering the bay. In addition, the primary VOCs observed were 1,1–DCE, 1,2–DCE, and VC, indicating that degradation of the TCE source product is occurring before the material reaches the bay.

Measurement of water seepage and VOC fluxes at six offshore stations where elevated VOCs were measured indicate that fluxes of VOCs to the bay are limited primarily to the areas around PW02 and PW03 between Bravo Pier and the shore. Seepage measurements show that the flux is driven largely by a tidal pumping of the porewater in which porewater with elevated VOC levels migrates out during low water, and bay water with undetectable VOC levels returns to the sediment during high water. The flux measurements indicate that overall, the largest VOC flux to the bay is for 1,2–DCE with an estimated total annual input of about 4.6 kg, followed by 1,1–DCE with 1.4 kg, VC with 1.3 kg, and TCE with 0.001 kg (1.2 g).

Based on the low/undetectable levels of VOCs in ambient bay water, the relatively high solubility of the target VOCs, and the close proximity to the mouth of the bay, it appears likely that any materials entering the bay at this site are rapidly flushed to the ocean. However, the potential for localized effects on infaunal organisms near PW02 and PW03 does exist and should be evaluated.

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